PENNSTATE

1855

2004–06 Undergraduate Degree Programs Bulletin

2004–06 Undergraduate Degree Programs Bulletin

Information current as of March 1, 2004.
For more up-to-date information, visit the
Undergraduate Bulletin on the Web:
www.psu.edu/bulletins/bluebook

USING THIS BULLETIN

This bulletin is intended to serve as a basic tool in academic program planning: students should become familiar with its information, which is updated annually. The bulletin is divided into three sections.

General Information The General Information section describes the University—its responsibilities for resident instruction, continuing education, and research; its policies regarding admission, tuition and charges, agencies and services, and student aid. Particular attention should be paid to the General Education program requirements.

Undergraduate Programs This section offers an outline of each college's and school's general requirements and the specific requirements for each major in that college or school. Information on ROTC programs and intercollege programs is also included in this section. To find information on specific academic majors, use the subject index in this bulletin.

Course Descriptions A brief description of each course offered by every academic unit is presented in this section. In consultation with an academic adviser, the student can use these descriptions to select courses for a semester schedule as well as to plan for course work to fulfill the General Education, general college graduation requirements, and specific major requirements.

Index The Index appears after the Course Descriptions.

REGULATIONS SUBJECT TO CHANGE

Each step of the educational process, from admission through graduation, requires continuing review and appropriate approval by University officials. The University, therefore, reserves the right to change the requirements and regulations contained in this bulletin and to determine whether a student has satisfactorily met its requirements for admission or graduation, and to reject any applicant for any reason the University determines to be material to the applicant's qualifications to pursue higher education.

ACKNOWLEDGMENTS

The Department of University Publications wishes to thank the Curriculum Coordinator, the staff of the University Faculty Senate office, members of the Senate Committee on Curricular Affairs, staff of the office of the Vice Provost for Undergraduate Education and International Programs, and all University faculty and staff for their dedicated assistance in producing this bulletin.

UNIVERSITY PHONE NUMBERS AND WEB SITE

To telephone the administrative headquarters of the University at the University Park campus, dial (or ask the operator for) area code 814 and the desired number. If you do not know the number, your long-distance operator can obtain it for you. For telephone numbers of other Penn State locations, see page 8. Frequently used University Park campus numbers are:

Penn State Call Center (directory assistance): 814-865-4700; Undergraduate Admissions: 814-865-5471; Graduate Enrollment Services: 814-865-1795; Registrar's Office: 814-865-6357

The University's main Web address is: **www.psu.edu**. Addresses for other University sites are listed throughout the bulletin. The online Undergraduate Bulletin is at: **www.psu.edu/bulletins/bluebook.**

This publication is available in alternative media on request.

Penn State encourages qualified persons with disabilities to participate in its programs and activities. If you anticipate needing any type of accommodation or have questions about the physical access provided, please contact the Office for Disability Services, 814-863-1807, in advance of your participation or visit.

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The Pennsylvania State University is committed to the policy that all persons shall have equal access to programs, facilities, admission, and employment without regard to personal characteristics not related to ability, performance, or qualifications as determined by University policy or by state or federal authorities. It is the policy of the University to maintain an academic and work environment free of discrimination, including harassment. The Pennsylvania State University prohibits discrimination and harassment against any person because of age, ancestry, color, disability or handicap, national origin, race, religious creed, sex, sexual orientation, or veteran status. Discrimination or harassment against faculty, staff, or students will not be tolerated at The Pennsylvania State University. Direct all inquiries regarding the nondiscrimination policy to the Affirmative Action Director, The Pennsylvania State University, 328 Boucke Building, University Park, PA 16802-2801; Tel 814-865-4700/V, 814-863-1150/TTY.

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PRINTED IN CANADA 2004

STUDENT ACTION GUIDE AND CALENDAR

FALL 2004

[1] [3]Arrival day for new students, 8/27
Leave of absence deadline, 8/30
Student registration deadline, 8/30
[4]Classes begin, 8/31
Labor Day holiday, no classes, 9/06
[2]Late registration & drop/add period, 8/31–9/08
Intent to graduate activation period, 8/16–9/13
Final exam conflict filing period, 9/22–10/06
Study Day, 10/15
[2]Late drop deadline, 11/18
Thanksgiving Holiday, 11/24–11/26
Withdrawal deadline, 12/10
Classes end, 12/10
[3]Study days, 12/11–12/12
Final exams, 12/13–12/17
Commencement, 12/18

SPRING 2005

Leave of absence deadline, 1/07
[1] [3]Arrival day for new students, 1/08
Student registration deadline, 1/09
Classes begin, 1/10
[2]Late registration & drop/add period, 1/10–1/19
Intent to graduate activation period, 1/03–1/24
Final exam conflict filing period, 2/02–2/16
Spring break, 3/07–3/11
[2]Late drop deadline, 4/08
Withdrawal deadline, 4/29
Classes end, 4/29
[3]Study days, 4/30–5/01
[3]Final exams, 5/02–5/06
[3]Commencement, 5/13–5/14

SUMMER 2005

	Session 1	Session 2
[1] [3]Arrival day for new students	5/15	6/26
Student registration deadline	5/15	6/28
Classes begin	5/16	6/29
[2]Late registration & drop/add	5/16–19	6/29–7/05
Memorial Day holiday, no classes	5/30	----
Independence Day holiday, no classes	----	7/04
[2]Late drop deadline	6/16	8/02
Intent to graduate activation	5/16–6/17	5/16–6/17
Withdrawal deadline	6/24	8/10
Classes end	6/24	8/10
[3]Study days	6/25–26	8/11
[3]Final exams	6/27	8/12
[3]Commencement	8/13	8/13

FALL 2005

[1] [3]Arrival day for new students, 8/27
Leave of absence deadline, 8/29
Student registration deadline, 8/29
[4]Classes begin, 8/30
Labor Day holiday, no classes, 9/05
[2]Late registration & drop/add period, 8/30–9/07
Intent to graduate activation period, 8/15–9/12
Final exam conflict filing period, 9/21–10/05
Study Day, 10/14
[2]Late drop deadline, 11/16
Thanksgiving Holiday, 11/23–11/25
Withdrawal deadline, 12/09
Classes end, 12/09
[3]Study days, 12/10–12/11
Final exams, 12/12–12/16
Commencement, 12/17

NOTE: This calendar is subject to change without notice. In preparing the calendar for an academic year, the University makes every effort to avoid conflicts with religious holidays. However, conflicts are sometimes unavoidable. When they occur, efforts are made to make special arrangements for students affected. The official current calendar is on the Web at **www.psu.edu/registrar/**

[1]New international students may arrive several days prior to this date.

[2]These dates apply only to courses that begin and end as shown. Refer to the eLion "Course Drop Dates" application for further information. Starting with the first day of class, a tuition penalty may be charged if the course is dropped.

[3]These dates may vary at some non-University Park locations.

[4]To balance class offerings and laboratories so there are an equal number of Mondays through Fridays, the first day of class (Tuesday) will follow a Friday schedule.

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See **www.psu.edu/bulletins/bluebook/** under the General Information link.

PENN STATE UNDERGRADUATE LOCATIONS

Abington College
1600 Woodland Road
Abington PA 19001-3990
215-881-7300

Altoona College
3000 Ivyside Park
Altoona PA 16601-3760
814-949-5000

Berks-Lehigh Valley College

Penn State Berks
Tulpehocken Road
P O Box 7009
Reading PA 19610-6009
610-396-6000

Penn State Lehigh Valley
8380 Mohr Lane
Fogelsville PA 18051-9999
610-285-5000

Capital College

Penn State Harrisburg
777 W. Harrisburg Pike
Middletown PA 17057-4898
717-948-6000

Penn State Schuylkill
200 University Drive
Schuylkill Haven PA 17972-2208
570-385-6000

Commonwealth College

Penn State Beaver
100 University Drive
Monaca PA 15061-2799
724-773-3500

Penn State Delaware County
25 Yearsley Mill Road
Media PA 19063-5596
610-892-1350

Penn State DuBois
College Place
Dubois PA 15801-3199
814-375-4700

Penn State Fayette, The Eberly Campus
One University Drive
P O Box 519
Uniontown PA 15401-0519
724-430-4100

Penn State Hazleton
76 University Drive
Hazleton PA 18202
570-450-3000-1291

Penn State McKeesport
4000 University Drive
McKeesport PA 15132-7698
412-675-9000

Penn State Mont Alto
One Campus Drive
Mont Alto PA 17237-9703
717-749-6000

Penn State New Kensington
3550 Seventh Street Road, Rt. 780
Upper Burrell PA 15068-1798
724-334-5466

Penn State Shenango
147 Shenango Avenue
Sharon PA 16146-1537
724-983-2814

Penn State Wilkes-Barre
P O Box PSU, Old Route 115
Lehman PA 18627-0217
570-675-2171

Penn State Worthington Scranton
120 Ridge View Drive
Dunmore PA 18512-1699
570-963-2500

Penn State York
1031 Edgecomb Avenue
York PA 17403-3398
717-771-4000

Penn State Erie, The Behrend College
5091 Station Road
Erie PA 16563
814-898-6000-0101

Penn State University Park
University Park PA 16802
814-865-4700

Pennsylvania College of Technology
One College Avenue
Williamsport PA 17701-5799
570-326-3761

World Campus
www.worldcampus.psu.edu
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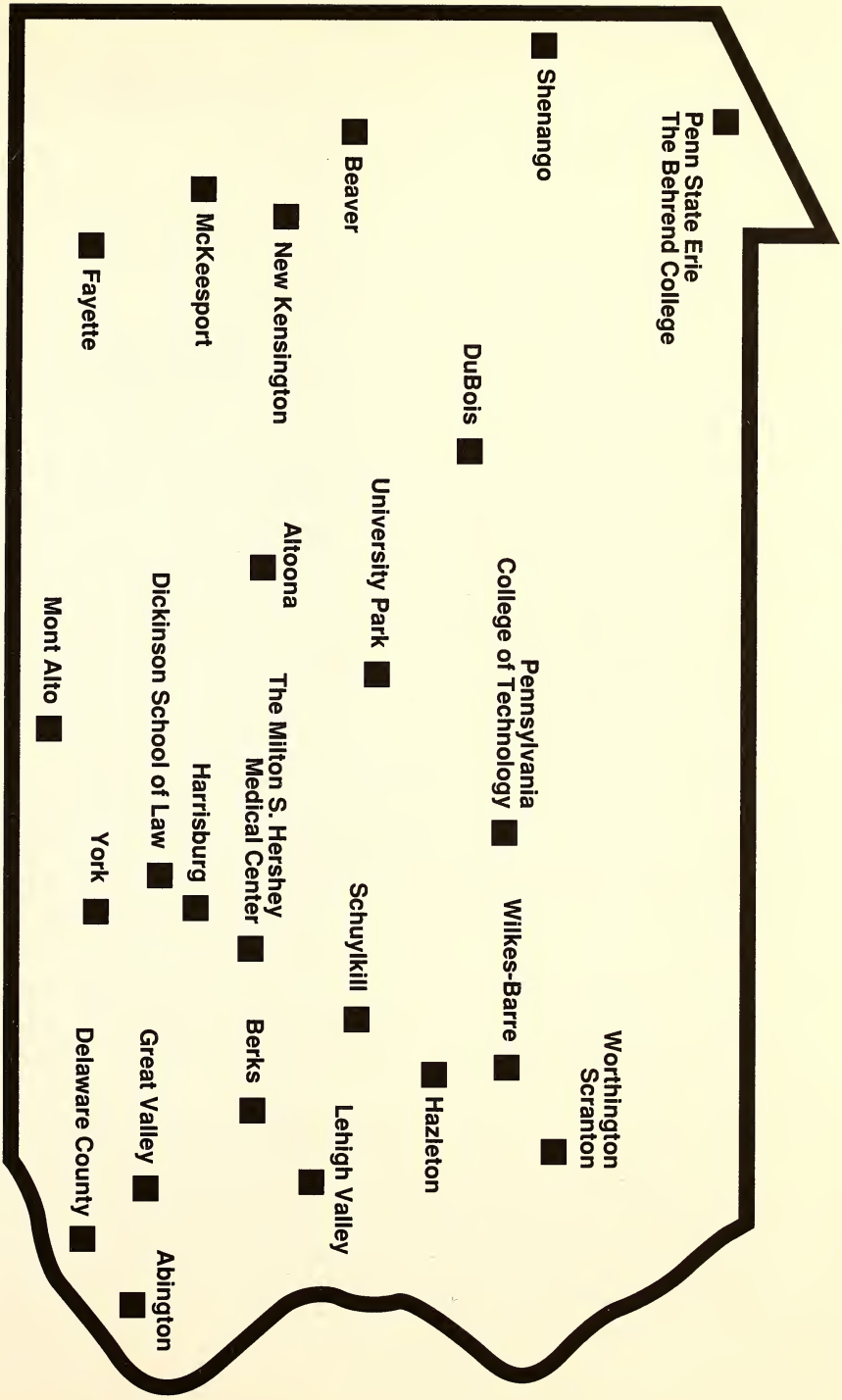
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Lehigh Valley
New Kensington
Altoona
The Milton S. Hershey
Medical Center
Berks
McKeesport
Harrisburg
Dickinson School of Law
Great Valley
Abington
Fayette
York
Delaware County
Mont Alto

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General Information

NOTE

Information in this section was current as of February 25, 2004. Please see the Undergraduate Bulletin on the Web for more current information: **www.psu.edu/bulletins/bluebook**

THE UNIVERSITY

MISSION OF THE UNIVERSITY

Penn State is a multicampus public land-grant university that improves the lives of people in Pennsylvania, the nation, and the world through integrated, high-quality programs in teaching, research, and service.

Our instructional mission includes undergraduate, graduate, and continuing and distance education informed by scholarship and research. Our research, scholarship, and creative activities promote human and economic development through the expansion of knowledge and its applications in the natural and applied sciences, social sciences, arts, humanities, and professions.

As a land-grant university, we also hold a unique responsibility for outreach and public service to support the citizens of Pennsylvania. We engage in collaborative activities with industrial, educational, and agricultural partners here and abroad to disseminate and apply knowledge.

OPTIONS FOR UNDERGRADUATE STUDY

The undergraduate degree programs of the University provide students with opportunities to increase their knowledge and understanding of the world and to grow in their individual skills and capabilities for learning, analyzing, creating, communicating, and forming good judgments. All undergraduate degree programs and courses offered by the colleges and other degree-granting units of the University are under the academic sponsorship of a faculty committed to scholarship and are implemented under the academic policies and student rules established by the University Faculty Senate. They are intended to be flexible in accommodating students interested in learning, whether through traditional or nontraditional offerings, while enrolled on either a part-time or a full-time basis. The degree programs and courses of the colleges and other degree-granting units are offered through resident or distance education. Credit courses are available to degree candidates on University campuses as well as through off-campus credit-granting activities such as internships, practicums, field trips, and foreign studies, as well as via continuing and distance education mechanisms, such as the World Campus. Students not formally admitted to degree candidacy (including provisional and nondegree students) may participate in resident offerings as time and space permit, as well as in continuing and distance education.

UNIVERSITY OUTREACH

Penn State extends the intellectual expertise and resources of the University through teaching, research, and service to address the social, civic, economic, and environmental issues and opportunities of our Commonwealth, nation, and world.

Working closely with the academic colleges, the University delivers outreach programs and services to support the needs of people throughout Pennsylvania and beyond at convenient times and accessible locations through Cooperative Extension, Continuing Education, Distance Education, and Public Broadcasting. University scholarship is shared using a variety of formats: print; multimedia-enhanced print; satellite; interactive compressed video; audiographics; on-site courses and certificate programs for credit; conferences; institutes and seminars; symposiums; continuing professional education; and management development programs and services.

RESEARCH

Research—in addition to teaching and public service—is a primary mission of the University. A strong research program strengthens both undergraduate and graduate education by building the body of knowledge and experience on which both are based.

For the graduate program, research furnishes thesis topics, stipend and tuition support, and experienced faculty to train students as the next generation of researchers. For undergraduate instruction, research brings to the classroom enthusiasm, practical experience, and up-to-date laboratory equipment, as well as opportunities for honors thesis topics and participation in research programs. Penn State's national academic reputation depends greatly on research publications and other scholarly activities of the faculty, whose combined teaching, research, and public service efforts are the hallmarks of a major university.

Most research at Penn State can be classified as either basic or applied. Basic research seeks to enlarge our body of knowledge or our fundamental understanding of the world around us. Examples include research aimed at understanding the origins of the universe or the socioeconomic factors perpetuating poverty or disease in underdeveloped parts of the world.

Applied research, on the other hand, utilizes fundamental knowledge derived from basic research to accomplish specific objectives. Examples include utilization of advancements in nanoscale manufacturing to make faster computer chips; personalized health care delivery to home-bound patients over the Internet; or use of newly developed animal feeds that minimize bacteria growth during preparation of foods for the market. While basic research is exceptionally well suited to the campus environment and continues to be one of the University's strengths, opportunities for applied research and partnerships with industry continue to grow at Penn State.

In addition to the extensive research programs housed within its colleges and departments, Penn State actively encourages and supports interdisciplinary research and education that transcends traditional discipline-oriented boundaries. Interdisciplinary programs in materials research; environmental research; children, youth, and families;

life sciences; population research; public policy; and arts and humanistic studies each draw extensively upon expertise from multiple supporting colleges. These programs not only benefit students and faculty with interests in the respective fields, but they stimulate nontraditional, multidisciplinary approaches in research and education.

The research accomplishments of Penn State faculty and students are extensively documented through publication in scientific and professional journals and in reports published by the University. Highlights of Penn State's exciting and broad-ranging research activities can also be found in *Research/Penn State,* an award-winning research magazine published on a quarterly basis that provides summary articles prepared for general readership.

INVENTIONS AND PATENTS

Patentable discoveries made by University faculty, staff, and graduate students that involve the use of University funds or facilities are the property of the University. Both undergraduate and graduate students fall within the University staff category whenever they are employed in connection with institutional research projects. Patents, with the inventors sharing in the royalties, are administered in the public interest by The Penn State Research Foundation, a nonprofit organization made up of faculty, alumni, industry representatives, and members of the University Board of Trustees. Royalty income is shared between inventor, the organizational unit, and The Penn State Research Foundation. The Penn State Research Foundation's share is used to foster the advancement of technology transfer and research at the University.

HISTORY

THE PENNSYLVANIA STATE UNIVERSITY, chartered by the Pennsylvania Legislature as the Farmers' High School in 1855, was founded by professional men, educated farmers, and state and county agricultural leaders. A faculty of four met the incoming class of sixty-nine students in February 1859.

In May 1862, the institution was renamed the Agriculture College of Pennsylvania, a name that recognized that its work was of collegiate level. Two months later, on July 2, President Abraham Lincoln signed the Morrill Land Grant Act, offering each state free public land that it could sell to endow institutions of higher learning where "the leading object shall be ... to teach such branches of learning as are related to agriculture and the mechanic arts ... in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life."

On April 1, 1863, the Pennsylvania General Assembly declared that the Morrill Act "is hereby accepted by the State of Pennsylvania with all its provisions and conditions and the faith of the State is hereby pledged to carry the same into effect." The legislature then designated Penn State as the land-grant college of the Commonwealth.

The college broadened the scope of its instruction and began to admit female students, increase its enrollment, and enlarge its physical plant. Graduate work was offered as early as 1862. In 1874, the college was renamed the Pennsylvania State College.

In 1953, the name was changed again—to The Pennsylvania State University—in formal recognition of what Penn State had long since become, one of the country's leading universities. Its undergraduate colleges now offer more than 160 baccalaureate and 20 associate degree majors.

The original student body of 69 has grown to more than 80,000, the faculty of four to to more than 6,000 full-time faculty. Beginning with an educational program that offered 40 courses, Penn State today offers more than 7,600 undergraduate and more than 3,700 graduate courses. The University, whose prime purpose has always been to serve the people and the interests of the Commonwealth and the nation, is accredited by the Middle States Association and is a member of the Association of American Universities.

HOLDINGS

The University owns more than 20,000 acres of land, including recreation areas, campuses, farms and agricultural experiment grounds, and forest tracts used for field work and research in forestry. There are more than 700 buildings on the University Park campus and more than 700 at other locations. Total valuation placed upon the entire University plant is approximately $2.7 billion.

SUPPORT

General operations of the University are supported by appropriations of the State Legislature, from tuitions and fees, and the balance from other income sources.

CONTROL

Control of the institution is vested in a Board of Trustees of thirty-two members. Members ex officio are the Governor of the Commonwealth; the President of the University; the state Secretary of Education; the state Secretary of Agriculture; and the state Secretary of Conservation and Natural Resources. Terms of the other trustees are three years. Six trustees are appointed by the governor, nine are elected by the alumni, six by delegates from county agricultural societies, and six by the board representing business and industry. Trustees are listed previously in this bulletin.

ACADEMIC ORGANIZATION OF THE UNIVERSITY

COLLEGES AND OTHER DEGREE-GRANTING UNITS

The following University colleges offer undergraduate majors leading to baccalaureate and associate degrees: Abington College; Altoona College; College of Agricultural Sciences; College of Arts and Architecture; Penn State Erie, The Behrend College; Berks-Lehigh Valley College; Smeal College of Business; Capital College; Commonwealth College; College of Communications; College of Earth and Mineral Sciences; College of Education; College of Engineering; College of Health and Human Development; School of Information Sciences and Technology; College of the Liberal Arts; and Eberly College of Science.

The Pennsylvania College of Technology in Williamsport provides an alternative educational setting in which students may enroll in selected degree programs.

Abington, Altoona, Berks-Lehigh, and Capital Colleges and the twelve-campus Commonwealth College are the result of a major reorganization of University that became effective July 1, 1997. The new colleges were formed in response to the need expressed by most campuses to be able to offer their own four-year programs in a quicker, more responsive manner to better serve the needs of Pennsylvanians.

Students who do not want to enroll immediately in one of the colleges or other degree-granting units may enroll in the Division of Undergraduate Studies, typically for one year or slightly more.

Majors leading to baccalaureate degrees are described by the colleges and other degree-granting units in the next section of this bulletin. Information is also accessible on the Internet through **www.psu.edu** (the Penn State home page).

SCHREYER HONORS COLLEGE

Schreyer Honors College is a University-wide honors college for academically superior students. It is designed to challenge them, to enrich and broaden their general education, and to deepen their preparation for graduate study or a profession. Academic excellence, research, leadership, civic engagement, and international education are promoted through various college programs.

Schreyer Scholars may choose from a wide variety of special honors sections of courses offered to satisfy Penn State's General Education component. Students' progress in their fields of specialization will be enhanced by special courses, independent study and research, graduate courses, and honors-option work in regular courses. Honors study in the first and sophomore years is focused mainly on General Education. In the junior and senior years, the emphasis is on work in the major, with independent study (research or creative work leading to an honors thesis), an honors notation on the diploma, and an honors medal as principal features. Honors advisers in a student's major assist with long-range academic planning of studies tailored to individual goals and accomplishments. Opportunities are available for honors international study and for integrating undergraduate and graduate study.

A residential program, including dinner-seminars with visiting scholars, artists, and persons in public life, is organized by Scholar Assistants. Living-learning environments in Atherton and Simmons Halls provide voluntary residential communities for Schreyer Scholars. All Scholars, including those in the performing arts, are encouraged to participate in the University's annual Undergraduate Exhibition.

Admission to the Honors College is by separate application. Entering first-year students must apply for admission to be selected. First-year candidates are expected to have excellent SAT scores and high school grades and a strong motivation for honors education. Every first-year student who accepts membership in the Schreyer Honors College receives a four-year renewable merit-based Academic Excellence Scholarship in the amount of $2,500 per year. Application materials can be obtained by contacting the Honors College office.

Rising juniors with excellent records and the nomination of their major programs are also invited to join by application through their academic major department. To remain in the Honors College, students must take at least three honors courses per year, file annual plans of study, and maintain a grade-point average of 3.33 each semester.

Departmental requirements to earn honors in a discipline operate within the minimum requirements of the Schreyer Honors College. Often these requirements involve certain prescribed honors courses and seminars taken in preparation for writing the honors thesis. Schreyer Scholars should inquire of the department or program in which they seek honors concerning its particular requirements.

For more information, contact Schreyer Honors College, The Pennsylvania State University, 10 Schreyer Honors College, University Park, PA 16802-3905; 814-863-2635; or scholars@psu.edu.

DIVISION OF UNDERGRADUATE STUDIES (DUS)

The Division of Undergraduate Studies (**www.psu.edu/dus**) is an academic unit of the University that offers the following programs at the University Park campus and all other undergraduate locations:

FIRST-YEAR TESTING, COUNSELING AND ADVISING PROGRAM (FTCAP)—First-year students admitted to the University are provided with comprehensive testing, educational planning, and academic advising prior to attending first-semester classes. The purpose of the First-Year Testing, Counseling and Advising Program (**www.psu.edu/dus/ftcap.htm**) is to provide all new students with assistance in evaluating their educational plans and objectives.

ENROLLMENT PROGRAM—New first-year students who prefer to test their abilities and interests or want to explore several areas of study before enrolling in one of the University's colleges or other degree-granting units can begin their studies in the Division of Undergraduate Studies. Other students who are enrolled in the University but who experience changes in interests or educational objectives, who discover new program opportunities, or who want to gain a better perspective of their abilities, may also seek enrollment in the division to facilitate a change to a new program of study.

ACADEMIC ADVISING AND EDUCATIONAL PLANNING PROGRAM—All students, whether or not they are enrolled in the Division of Undergraduate Studies, have available to them the professional advising, educational planning, and referral opportunities provided by DUS. The program is a supplement to and is coordinated with the advising programs of the colleges and other degree-granting units and faculty. Provisional students aspiring to degree programs are also served by the division.

ACADEMIC ADVISING PRACTICES AND INFORMATION PROGRAM—The Division of Undergraduate Studies provides a comprehensive academic information network throughout the University to assist faculty and other academic advisers in their advising responsibilities. eLion, the Web-based interactive system, provides valuable advising resources and support. It can be accessed at **eLion.psu.edu**.

UNIVERSITY FACULTY SENATE

The University Faculty Senate has the following functions: legislative, advisory and consultative, and forensic.

The electorate of the Senate includes all persons who are not candidates for degrees at Penn State who hold full-time academic appointments, and who fall into one of the following categories: those holding professorial, research (excluding noncontinuing research appointees), or librarian titles; and those who are full-time instructors or assistant librarians. The total number of appointed and ex officio members shall not exceed a number equal to 10 percent of the faculty senators. Likewise, student senators, undergraduate and graduate combined, shall not exceed a number equal to 10 percent of the elected faculty senators. The voting membership comprises the elected faculty senators, elected student senators, ex officio members, and appointed members.

The University Faculty Senate functions through its standing committees, of which there are fourteen: Committee on Committees and Rules; Committee on Admissions, Records, Scheduling, and Student Aid; Committee on Intra-University Relations; Committee on Computing and Information Systems; Committee on Curricular Affairs; Committee on University Planning; Committee on Faculty Affairs; Committee on Faculty Benefits; Committee on Intercollegiate Athletics; Committee on Libraries; Committee on Outreach Activities; Committee on Research; Committee on Student Life; and Committee on Undergraduate Education. Student senators serve on relevant committees. The Senate relies on these various standing committees as well as appointed ad hoc committees for the careful consideration and analysis of academic matters that are of concern to the Senate.

Each year the Senate Office, located in 101 Kern Building on the University Park campus, publishes *The Constitution, Bylaws, and Standing Rules of the University Faculty Senate* (which can be obtained upon request from the Senate Office) and edits *Academic Policies for Students* (which is a part of *Policies and Rules*, available at the HUB-Robeson Cultural Center information desk or at **www.psu.edu/polreg/studguid.html** on the Web).

UNIVERSITY LIBRARIES

The University Libraries, **www.libraries.psu.edu**, constitute a major resource for students and researchers in all fields of study. The Libraries contain more than 4.7 million volumes, more than 5.1 million microforms, and more than 57,000 serial subscriptions. In addition, Media and Technology Support Services (MediaTech), **www.libraries.psu.edu/mtss**, a division of the Libraries, has a collection of more than 20,000 films and videotapes and more than 4,500 pieces of technology and audiovisual equipment.

At University Park, the Libraries include nine subject libraries in Pattee Library and Paterno Library and five additional subject libraries at branch locations, including Architecture, Fletcher L. Byrom Earth and Mineral Sciences, Engineering, Pollock Laptop, and Physical and Mathematical Sciences libraries. Twenty-three other locations include campus and college libraries at Penn State's campuses throughout the Commonwealth and the Dickinson School of Law, the Milton S. Hershey Medical Center, and Penn College.

Pattee Library houses the George and Sherry Middlemas Arts and Humanities Library, Reserve Reading Room, Class of 1994 Extended Hours Reading Room, the News and Microforms Library, and the Gateway Library. Paterno Library houses the Maps Library; The Eberly Family Special Collections Library, including Historical Collections and Labor Archives, Rare Books and Manuscripts, and the Penn State University Archives; Social Sciences Library; William and Joan Schreyer Business Library; Life Sciences Library; and Education and Behavioral Sciences Library. Special collections include the Allison-Shelley Collection, the United Steelworkers of America archives, the John O'Hara papers, and the nation's largest collections of Australiana and Utopian literature, among others.

Access to holdings is obtained through a computerized catalog, part of the Library Information Access System (LIAS), available on the Web at **www.libraries.psu.edu**. LIAS is a dynamic, integrated information system that provides electronic access to a great variety of materials in many subject areas, including course reserves. A growing collection of over 400 databases, including 8,000 journals with full-text articles, is available on E-Resource List (A–Z). Introductory sessions, announced on the Libraries Web page, are offered on a regular basis to familiarize faculty, students, and other library users with LIAS. Instructional Programs are listed at **www.libraries.psu.edu/instruction**.

The Libraries maintain a comprehensive program of general and specialized reference and instructional services. The Libraries' faculty teach credit courses as part of the Library Studies Program, conduct topical seminars, and provide instruction on bibliography and library research to students in hundreds of University courses. Services offered include computerized literature searches in a variety of databases and resource sharing networks available through Interlibrary Loan for materials not part of the Libraries' collection. In addition, services and equipment are available to assist patrons with disabilities in their use of library collections through Marion MacKinnon Library Services for People with Disabilities.

A printed "Guide to the University Libraries" offers additional information on services and programs and is available at Libraries service desks and by calling 814-865-0401.

PENNSYLVANIA COLLEGE OF TECHNOLOGY

Penn College is a special mission affiliate of Penn State, committed to applied technology education. Partnerships with business and industry are a key ingredient of Penn College's "degrees that work." Unique bachelor's and associate degree programs combine hands-on instructional opportunities with theory and management education to prepare graduates for success in the world of work.

More than one-third of Penn College students are enrolled in baccalaureate degree majors that emphasize applied technology in fields including business, computer, design, construction, and industrial technologies, health sciences, human services, communications, hospitality, environmental and transportation technologies. Other students are enrolled in programs that offer associate degrees or certificates, as well as college and university transfer options.

Penn College offers a rich campus life experience, including on- and off-campus housing, intercollegiate and intramural athletics, and student governance and organizations.

As Pennsylvania's premier technical college, Penn College also offers a wide variety of Workforce Development and Continuing Education initiatives that support business and industry throughout the Commonwealth.

THE GRADUATE SCHOOL

The Graduate School offers twenty distinct academic and professional degrees in more than 150 fields of study. Graduate study can be pursued at several locations in Pennsylvania: the University Park campus, State College; Penn State Erie, The Behrend College; Penn State Harrisburg, Middletown; Penn State Great Valley, Malvern; and the College of Medicine, Penn State Milton S. Hershey Medical Center, Hershey.

For admission to the Graduate School, an applicant must have received a baccalaureate degree from an accredited institution, earned under residence and credit conditions substantially equivalent to those required by Penn State. Although the Graduate School has no fixed minimum grade-point requirement for admission, an applicant is generally expected to maintain a junior–senior grade-point average of at least 2.50 on Penn State's grading scale of A (4.00) to D (1.00). Individual programs often establish higher grade-point average requirements and use other criteria to judge candidates for admission. Scores on the Graduate Record Examination (GRE) (verbal, quantitative, and analytical) are required by many programs.

Detailed information concerning admission, major programs of study, degree requirements, financial aid, and other matters of general interest to graduate students can be found on the Graduate School Web site at: **www.gradsch.psu.edu.**

THE DICKINSON SCHOOL OF LAW

On July 1, 1997, The Dickinson School of Law in Carlisle, Pennsylvania, affiliated with Penn State, becoming The Dickinson School of Law of The Pennsylvania State University. Founded in 1834, Dickinson is the oldest law school in Pennsylvania and one of the oldest in the nation. It offers the degrees of juris doctor and master of laws in comparative law.

The Dickinson School of Law stresses a balance between the theoretical and practical aspects of legal education in a curriculum that helps prepare its graduates to practice in any jurisdiction. Dickinson has been an innovator in the teaching of advocacy and other lawyering skills and in providing real-life, hands-on experiences in legal clinics such as the Family and Disability law clinics. The Law School offers concurrent degree programs with other Penn State colleges that enable students to earn both a law degree and a master's degree in such fields as public administration, business administration, and environmental pollution control.

For more information about Dickinson and its programs, call 717-240-5207; or write to The Dickinson School of Law, The Pennsylvania State University, 150 South College Street, Carlisle, PA 17013; or visit Penn State's home page at **www.psu.edu** on the Web.

THE COLLEGE OF MEDICINE

Penn State College of Medicine is adjacent to Penn State Milton S. Hershey Medical Center in Hershey, Pennsylvania. The College of Medicine confers four degrees: the Doctor of Medicine, the Doctor of Philosophy, the Master of Science, and a combined Doctor of Medicine/Doctor of Philosophy degree. The center also conducts full-time certificate programs in radiologic technology, and cardiovascular perfusion technology.

More details can be obtained from the Office of Student Affairs, Penn State Milton S. Hershey Medical Center, The Pennsylvania State University, P.O. Box 850, Hershey, PA 17033-0850.

ADMISSION

STATEMENT OF BASIC ACADEMIC ADMISSION POLICIES

Admission to University credit courses or degree candidacy at The Pennsylvania State University is governed by policies established by the University Faculty Senate. Although specific applications of these policies may vary from year to year, from location to location, and from program to program, all University admissions are governed by the following general policies:

1. As an institution of higher education, The Pennsylvania State University is committed to making post-high school education available to all who possess a high school diploma or its equivalent without regard to personal characteristics not related to ability, performance, or qualifications. The Pennsylvania State University does not discriminate against any person because of age, ancestry, color, disability or handicap, national origin, race, religious creed, sex, sexual orientation, or veteran status.

2. The primary responsibility of the University is to residents of the Commonwealth of Pennsylvania. Consequently, within limits expressed from time to time by the Board of Trustees of the University, preference shall be given to Pennsylvania residents in the various admissions processes.

3. In order to meet the variety of goals and objectives of the population, the spectrum of offerings is designed to enable persons with a variety of objectives--both degree and nondegree--to receive a higher education. Although access to educational opportunities of the University is open to all, courses offered for credit are available to those holding a high school diploma or its equivalent. Policies governing admission to degree candidacy are established by the University Faculty Senate (with delegation of policies governing admissions to graduate programs to the Graduate Faculty of the University) under a general policy of offering admission to those whose past academic performance indicates a reasonable probability of success.

4. Undergraduate students are admitted to either baccalaureate degree candidacy or associate degree candidacy. To be admitted to degree candidacy, the individual must present an academic performance record that indicates a reasonable probability of his or her success in his or her chosen program. In the case of freshman admission to undergraduate degree candidacy, performance is measured through the high school record and standardized test results. In the case of advanced standing admission, performance is measured either through success in nondegree programs and courses of the University or by success at some other institution of higher education.

5. Within the space available in particular programs and at particular locations, admission shall be offered preferentially to those whose performance record indicates the highest probability of success in the chosen program--with this process continuing until all available spaces are filled. Although exceptions to this policy may be made from time to time (for example, recipients of scholarships with restricting qualifications), these exceptions may be made only for students who meet at least the minimum admission and entrance requirements.

6. If a college or school requires restrictions on its baccalaureate admissions, the priorities or targets established must include provisions to consider qualified students in each of these groups:

Admissions Group I–Freshman Admissions: Students who hold a high school diploma or equivalent, who present fewer than 18 semester credits of baccalaureate work (from Penn State or another regionally accredited institution), who meet minimum college or school entrance requirements, and who meet minimum college or school admission standards.

Admissions Group II–The Pennsylvania State University Advanced Standing Admissions: Students who (1) request baccalaureate degree reenrollment, presenting 18 or more semester credits; (2) request a change from Penn State associate degree to baccalaureate degree status, presenting 18 or more applicable semester credits; (3) request a change from Penn State provisional degree to baccalaureate degree status, presenting 18 or more applicable semester credits; or (4) request a change from Penn State nondegree to baccalaureate degree status, presenting 18 or more applicable semester credits. In all advanced standing admissions at Penn State, the student must have a grade-point average of at least 2.00 and must meet the minimum entrance and advanced standing requirements of the college or school. However, a student who has had an interruption in enrollment at Penn State of no fewer than four calendar years and whose cumulative grade-point average is less than 2.00 may petition for reenrollment with academic renewal in accordance with Senate Policy 57-00.

Admissions Group III–Other Advanced Standing Admissions: Students who have not been students at Penn State and request baccalaureate degree status at Penn State, presenting 18 or more applicable semester credits from a regionally accredited institution. In all advanced standing admissions, it is understood that the student must have a cumulative grade-point average of 2.00 as computed at Penn State and meet the minimum entrance and advanced standing requirements of the college or school. However, a student who has not met the entrance requirements or achieved a cumulative grade-point average of 2.00 (on a 4.00 scale) for all graded courses taken at all institutions

previously attended, and who has had a four-calendar-year absence from the institution(s), may apply to enroll in credit courses as a provisional student in accordance with Senate Policy 10-00. A student who has had an absence from the institution(s) of fewer than four calendar years, and who has not met the entrance requirements or has achieved a cumulative grade-point average of less than 2.00, may apply to enroll in credit courses as a nondegree student in accordance with Senate Policy 14-00.

Within these three groups, no special consideration will be given to any group; students will be admitted to the college or school on the basis of academic competition (e.g., SAT I scores, grade-point averages, grades in required courses in the college or other degree-granting unit, and other evidence predictive of baccalaureate degree performance where available, valid, and reliable).

7. To ensure a proper educational mix of students and to further broaden the educational opportunities offered by the University, the University Faculty Senate and the University administration from time to time may authorize various specialized programs. These programs may permit students who do not meet the basic qualifications for admission to degree candidacy to be admitted to such candidacy. These programs may also permit, in selected situations, exceptional students who have not earned a high school diploma or its equivalent to enroll in University credit courses. Such specialized programs may include up to 10 percent of the total admissions group for the University in any one year and up to the maximum of 15 percent of the admissions to any geographic location of the University.

8. Within this general policy, the colleges and school of the University, with the concurrence of the University Faculty Senate, may impose certain educational background requirements (Carnegie Units) that must be completed by an individual before being admitted to degree candidacy.

MINIMUM REQUIREMENTS FOR ADMISSION TO DEGREE CANDIDACY

To be eligible for admission consideration to the University as a degree candidate, either as a beginning student or as a student with advanced standing, an applicant must meet the following minimum requirements:

1. Graduation from an accredited secondary school.

2. Completion of the required units of preparatory work as indicated under the heading of Minimum Secondary School Units Required for Admission Consideration in this bulletin.

A secondary school diploma issued by the Pennsylvania Department of Education, or appropriate authority in another state, may be accepted as equivalent to graduation from an accredited secondary school and as equivalent to the minimum secondary school units required for admission, as indicated under the Minimum Secondary School Units Required for Admission Consideration heading, with the exception of math and foreign language.

The University accepts the definition of a secondary school unit as established by the Carnegie Foundation. A unit represents a year of work in a subject in a preparatory school or secondary school, provided that the work done in that subject is approximately one-fourth of the total amount of work regularly required in a year in the school.

The University reserves the right to deny admission to any applicant for admission for any reason the University determines to be material to the applicant's qualifications to pursue higher education.

Admission to degree candidacy is specified in terms of enrollment in a college or school of the University or in the Division of Undergraduate Studies. Entrance to a major is a subsequent step that normally occurs near the end of the second year of study. Both for admission to a college or school and for entrance to a major, a student must satisfy the requirements of the University, of the particular college or school, and of the major area. In special circumstances, the University may need to further restrict admissions to a college or school and entrance to majors because of space limitations.

MINIMUM SECONDARY SCHOOL UNITS REQUIRED FOR ADMISSION TO ASSOCIATE DEGREE PROGRAMS

The minimum number of secondary school units required for admission consideration to **associate degree programs** is indicated by the chart shown here. The majors offered by the colleges and school of the University are shown in the Undergraduate Programs section of this bulletin.

	English	Math C*	Math D**	Math E***	Science	Arts/Human./ Soc. Studies/ Foreign Langs.
TWO-YEAR DEGREE MAJORS						
Agricultural Business	4			2	2	5
Architectural Engineering Technology	4	2			2	5
Biomedical Engineering Technology	4	2			2	5
Business Administration (2-year)	4		2		2	5
Business, General	4		2		2	5
Criminal Justice	4			2	2	5
Dietetic Food Systems Management	4			2	2	5
Electrical Engineering Technology	4	2			2	5
Forest Technology	4		2		2	5
Hotel, Restaurant, and Institutional Management (2-year)	4			2	2	5
Human Development and Family Studies	4			2	2	5
Information Sciences and Technology	4	2			2	5
Letters, Arts, and Sciences	4			2	2	5
Manufacturing Technology	4		2		2	5
Materials Engineering Technology	4	2			2	5
Mechanical Engineering Technology	4	2			2	5
Medical Laboratory Technology	4	2			2+	5
Nanofabrication Manufacturing Tech	4	2			2	5
Nursing (2-year)	4		2		2++	5
Occupational Therapy	4			2	2	5
Physical Therapist Assistant	4		2		2+++	5
Plastics Engineering Technology	4	2			2	5
Radiological Sciences	4	2			2	5
Science (2-year)	4	2			2	5
Surveying Technology	4	2			2	5
Telecommunications Technology	4	2			2	5
Wildlife Technology	4		2		2	5

*Math C requirements may be satisfied by at least 2 units of mathematics: 1 unit of algebra and 1 additional unit in any combination of advanced algebra, plane geometry, solid geometry, or trigonometry.

**Math D requirements may be satisfied by at least 2 units of mathematics: 1 unit of algebra and 1 additional unit of mathematics. Plane geometry is recommended for Business Administration, Forest Technology, and Wildlife Technology.

***Math E requirements may be satisfied by any 2 units of mathematics.

+Students entering Medical Laboratory Technology should have 1 unit each in biology and chemistry.

++Students entering Nursing are required to have 1 unit in biology and 1 unit in chemistry.

+++Students entering Physical Therapist Assistant should have 1 unit in biology plus one other science course.

MINIMUM SECONDARY SCHOOL UNITS REQUIRED FOR ADMISSION TO BACCALAUREATE DEGREE PROGRAMS

The minimum number of secondary school units required for admission consideration to **baccalaureate degree programs** is indicated by the chart shown here. The majors offered by the colleges and school of the University are shown in the Undergraduate Programs section of this bulletin.

	English	Math A*	Math B**	Arts/Human./ Soc. Studies/ Foreign Langs.	Science
¶Abington College	4		3	5	3
Agricultural Sciences	4		3	5	3
¶Altoona College	4		3	5	3
Arts and Architecture	4		3	5	3
¶¶Berks-Lehigh Valley College	4		3	5	3
Smeal College of Business Administration	4	3		5	3
Commonwealth College	4		3	5	3
†College of Communications	4		3	5	3
Division of Undergraduate Studies	4		3	5	3
††Earth and Mineral Sciences	4	3		5	3
Education	4		3	5	3
††Engineering	4	3		5	3
Health and Human Development	4		3	5	3
Information Sciences and Technology	4	3		5	3
The Liberal Arts	4		3	5	3
††Eberly College of Science	4	3		5	3
Penn State Erie, The Behrend College					
¶¶¶Erie—Business, Engineering/Engineering Technology, and Science programs	4	3		5	3
Erie—Humanities and Social Sciences	4		3	5	3
¶¶¶Penn State Harrisburg					
Harrisburg—Business, Engineering/ Engineering Technology, and Science programs	4	3		5	3
Harrisburg—Humanities and Social Sciences	4		3	5	3

*Math A requires 1-1/2 units of algebra, 1 unit of plane geometry, and 1/2 unit of trigonometry.

**Math B may be satisfied by 3 units selected from algebra, geometry, and trigonometry.

†Two units in the same foreign/second language are required for the College of Communications. Two units of the same foreign language are recommended, rather than required, for all other programs. NOTE: Students who graduated from high school in the year 2001 or later or who have not completed the recommended two high school units of the same foreign language, or who have not completed one 3- to 4-semester credit foreign language course with a grade of C (2.0) or higher at the collegiate level, will need to schedule the appropriate foreign language course work at Penn State within their first two years of study. This requirement may be met by taking one 3- to 4-semester credit course in a foreign/second language at the college level at either Penn State or another regionally accredited institution. Credits taken to meet the foreign/second language requirement cannot be counted toward graduation from a baccalaureate program at Penn State, although they will be counted as part of a student's academic course schedule. The requirement will not apply to students who can demonstrate fluency in a foreign/second language.

††Some preparation in chemistry and physics is advised for admission to these colleges.

¶Abington and Altoona—Business and Science require Math A, and Science recommends preparation in chemistry and physics.

¶¶Berks-Lehigh Valley—Science requires Math A and recommends preparation in chemistry and physics

¶¶¶Erie and Harrisburg—Engineering/Engineering Technology and Science recommend preparation in chemistry and physics.

FIRST-YEAR ADMISSION

An applicant for admission as a beginning student in the first-year class must meet the minimum requirements for admission to degree candidacy prior to the time of matriculation. All offers of admission are conditional until these requirements have been met.

Each applicant is evaluated on the basis of the high school record and results of the Scholastic Assessment Test (SAT I) or American College Test (ACT). This evaluation produces an evaluation index. Admission decisions are made on the basis of a review of the applicant's evaluation index in relation to the requested area of enrollment (academic program), space availability, the quality of the credentials presented by other applicants, and such other academically relevant information deemed appropriate by the Office of Admissions and approved by the Senate Committee on Admission, Records, Scheduling, and Student Aid.

When openings at the requested location or in the requested program of the University are filled, qualified applicants will be offered admission to their alternate choice of program or location or notified of campuses where openings still exist.

COLLEGE ENTRANCE TESTS—Applicants for first-year admission to the University are required to submit scores of the Scholastic Assessment Test (SAT I) of the College Entrance Examination Board or the American College Test (ACT). SAT I or ACT results of the junior-year testing periods are recommended. The SAT I is preferred. Exceptions to the requirement for scholastic assessment test scores will be granted to adult learners who have been out of high school for five or more years or are veterans with four or more years of service. Exceptions to the required courses completed also may be granted. Adults may be requested to submit a statement of personal goals or to participate in an interview.

SELECTION OF THE AREA OF ENROLLMENT—It is necessary for an applicant to indicate one of the academic units of the University in which he or she wants to study. If an applicant is undecided about the choice of an academic unit, he or she may seek enrollment in the Division of Undergraduate Studies.

CHANGING THE AREA OF ENROLLMENT—An applicant who has been admitted to an academic college or unit of the University may not change to another without satisfying entrance requirements of the college or other academic unit of the University to which he or she wants to transfer.

PREVIOUS ATTENDANCE AT ANOTHER COLLEGE—An applicant must state on his or her application whether he or she has ever attended any other college or university. Failure to indicate, at the time of application, previous registration at another college or university may result in refusal or cancellation of admission. An applicant who has attempted fewer than 18 semester credits at another regionally accredited college or university will be considered as a first-year applicant. An applicant who has attempted 18 or more semester credits at another regionally accredited college or university subsequent to high school graduation will be evaluated as an advanced standing applicant.

OBTAINING AN APPLICATION—An application is available on the Web at **www.psu.edu/admissions**. Web applications are preferred. A paper application can be obtained by writing to the Undergraduate Admissions Office, The Pennsylvania State University, 201 Shields Building, Box 3000, University Park, PA 16804-3000 (814-865-5471) or by contacting an admissions officer at any University location.

ADVANCED STANDING ADMISSION

An applicant who has attended any regionally accredited college or institution on the college level and attempted 18 or more semester credits subsequent to high school graduation may be considered for admission with advanced standing. Attendance at any other institution must be reported at the time of application. Failure to indicate, at the time of application, previous registration at another college or university may result in refusal or cancellation of admission.

An applicant for admission with advanced standing must meet the minimum secondary school requirements for admission to degree candidacy prior to the time of matriculation. Advanced standing applicants are considered for admission on the basis of the applicant's requested academic program, space availability, and the academic quality of their work at the previously attended institution(s). A minimum cumulative grade-point average of at least 2.00 (C) out of 4.00, as computed for Penn State students, is required, although certain areas of study may have additional requirements. In addition, an applicant must be in good academic and nonacademic standing. A student who has not met the entrance requirements or achieved a cumulative grade-point average of 2.00 (on a 4.00 scale) for all graded courses taken at all institutions previously attended, and who has had a four-calendar-year absence from the institution(s), may apply to enroll in credit courses as a provisional student in accordance with Senate Policy 10-00. A student who has had an absence from the institution(s) of fewer than four calendar years, and who has not met the entrance requirements or has achieved a grade-point average of less than 2.00, may apply to enroll in credit courses as a nondegree student in accordance with Senate Policy 14-00.

Advanced standing credits may be awarded for college-level work taken at regionally accredited institutions provided the course grade earned is equivalent to a grade of A, B, or C at this University and the credits are useful to the student's program of study. An academic adviser determines which of the transferable credits are applicable to the program of study at Penn State. Credits are transferred, but grades and grade points are not. Advanced

standing students enter the University without an average and their average begins with the completion of their first semester of study at Penn State.

Under certain circumstances, the University may need to restrict advanced standing admissions to a particular college or school because of space limitations.

Entrance to a major is an additional step beyond admission to a college or school. It involves additional academic requirements and may be subject to additional restrictions because of space limitations.

APPLICATION PROCEDURE—An application is available on the Web at **www.psu.edu/admissions**. Web appliations are preferred. A paper application can be obtained by writing to the Undergraduate Admissions Office, The Pennsylvania State University, 201 Shields Building, Box 3000, University Park, PA 16804-3000 (814-865-5471) or by contacting an admissions officer at any University location. In all cases where work has been taken at other institutions, an official transcript from each place of attendance must be submitted directly to the Undergraduate Admissions Office by the registrar of the institution attended. An applicant currently attending another institution also must provide a schedule of courses in progress or to be completed before enrollment at Penn State, including course name, number, description, and number of credits. The applicant's secondary school record must be submitted directly to the Undergraduate Admissions Office by the school. The Undergraduate Admissions Office may require the student to send a catalog showing the courses that he or she has taken at the college previously attended. All credentials become part of the permanent records of the University.

ENTRANCE TO A MAJOR—An advanced standing degree candidate may be admitted to a college, or school of the University, or to the Division of Undergraduate Studies rather than to a major. To be eligible for entrance to a major, a student must meet the entrance-to-major requirements of the University, of the college or school, and of the program area. Under certain circumstances, further restrictions or exceptions on entrance to majors may be required because of space limitations. Students are expected to work with advisers and to utilize current information about entrance requirements and restrictions when exploring academic program alternatives and making program and course selections.

CHANGING THE AREA OF ENROLLMENT—An applicant who has been admitted to an academic college, school, division, or major of the University may not change to another without satisfying entrance requirements of the college/school/division and major to which he or she wants to transfer.

PROVISIONAL STUDENTS (DEGREE-SEEKING)

An applicant seeking to pursue a degree program and holding a high school diploma or its equivalent but without the criteria required for admission as a degree candidate may enroll at the University as a provisional student. A provisional student may enroll in credit courses if the following criteria are met:

1. The student is making satisfactory progress toward admission as a degree candidate. Progress is satisfactory if a student has completed 18 credits with a minimum cumulative grade-point average of 2.00 (on a 4.00 scale). If a student has completed 18 credits with less than a 2.00, then he or she is given a warning. A student who has completed 27 credits with a cumulative grade-point average of less than 2.00 will not be permitted to enroll as a provisional student in any subsequent semester, unless the student has earned more than a 2.0 grade-point average in the most recently completed semester. No student, regardless of cumulative grade-point average, who has completed 36 credits will be permitted to enroll as a provisional student in any subsequent semester.
2. There is space available after degree candidates have been accommodated.
3. The student has not been dropped for unsatisfactory scholarship from any college or university previously attended. If a provisional applicant attended another college or university and attempted 18 or more semester credits within the last four calendar years, the applicant must have at least a 2.0 (on a 4.0 scale) cumulative collegiate average. However, if it has been four or more calendar years since the applicant attended the other college or university and the cumulative grade-point average is less than 2.0, the applicant is eligible for provisional admission consideration.
4. The student has not been dismissed or suspended for nonacademic reasons from any college or university. An applicant not in good standing at another accredited college or university for disciplinary reasons must consult with the director of the Office of Judicial Affairs for admissions clearance.

NOTE: An applicant holding a baccalaureate degree or higher is not eligible to enroll as a provisional student. The applicant is referred to the graduate nondegree program.

OBTAINING AN APPLICATION—An application is available on the Web at **www.psu.edu/admissions**. Web applications are preferred. A paper application can be obtained by writing to the Undergraduate Admissions Office, The Pennsylvania State University, 201 Shields Building, Box 3000, University Park, PA 16804-3000 (814-865-5471), by contacting an admissions officer at any University location, or on the Web at **www.psu.edu**.

ADMISSION OF PROVISIONAL STUDENT AS A DEGREE CANDIDATE—A provisional student may apply for admission as a baccalaureate degree candidate with advanced standing to a college or school of the University, or to the Division of Undergraduate Studies, upon completion of at least 18 credits with at least a 2.00 cumulative grade-point average. All these credits must be earned at this university. To be eligible for admission, the provision-

al student must meet the academic requirements of the University and the college or school that are in effect at the time of application. An applicant who has completed at least the equivalent of two years of baccalaureate degree work before applying for admission as a baccalaureate degree candidate must have the approval of either the dean of the college or school of the University in which enrollment is desired or of the director of the Division of Undergraduate Studies if the student wants to enroll in that division. Under certain circumstances, the University may need to restrict admissions to degree candidacy in a particular college or school because of space limitations. Entrance to a major is an additional step beyond admission to a college or school and further limitations may apply. Provisional students should work with their advisers and utilize current information about college or school and major program academic requirements and restrictions in planning their programs of study toward admission to degree candidacy. After a student is admitted as a degree candidate, the dean of the college or school of enrollment decides which credits earned as a provisional student may be used to fulfill the degree requirements.

NONDEGREE STUDENTS

Any person having received a high school diploma or its equivalent may be permitted to enroll in credit courses (either for credit or audit) at the University. Some of these persons will be classified as nondegree students. A nondegree student who has not been dropped from degree or provisional status by this university or any other college or university for unsatisfactory scholarship will be listed as a nondegree regular student and may enroll in any number of credits not to exceed the typical credit load of a full-time student per semester if criteria 1, 2, and 3 (on the following list) are met.

A nondegree student who has been dropped from degree or provisional status by this university or any other college or university because of unsatisfactory scholarship will be listed as a nondegree conditional student and may enroll in a maximum of 12 credits per semester if criteria 1, 2, 3, and 4 (on the following list) are met.

1. The student has completed the prerequisite for the courses to be scheduled or has obtained permission from the instructor to schedule the course.
2. Space is available after degree candidates and provisional students have been accommodated.
3. The student has not been dismissed or suspended for nonacademic reasons from any college or university. An applicant not in good standing at another college or university for disciplinary reasons must consult the director of the Office of Judicial Affairs for admission clearance.
4. The student has obtained academic advising/counseling from an adviser/counselor designated by the academic unit to which admission, or reinstatement and reenrollment, is desired.

NOTE: A student must be admitted, or reinstated and re-enrolled, as a degree candidate to apply the credits earned as a nondegree student toward fulfilling the requirements for a degree. The dean of the college or school of enrollment shall decide which credits may be used to fulfill the degree requirements.

OBTAINING AN APPLICATION—A nondegree application can be obtained by contacting the Office of the University Registrar, The Pennsylvania State University, 112 Shields Building, University Park, PA 16802-1292 (telephone: 814-865-6357); the Registrar's office at any University location. The form is also available at **www.psu.edu/registrar** on the Web.

ADMISSION OF NONDEGREE STUDENT AS A DEGREE CANDIDATE—A nondegree student may apply for admission as a baccalaureate degree candidate with advanced standing to a college or school of the University, or to the Division of Undergraduate Studies, upon completion of at least 18 credits earned at this University with at least a 2.00 cumulative grade-point average. An applicant who has completed at least the equivalent of two years of baccalaureate degree work before applying for admission as a baccalaureate degree candidate must have the approval of either the dean of the college or school in which enrollment is desired or of the director of the Division of Undergraduate Studies if the student wants to enroll in that division. To be eligible for degree admission, the nondegree student must meet the academic requirements of the University and the college or school in effect at the time of application. Entrance to a major is an additional step beyond admission. Under certain circumstances, the University may need to restrict admissions to degree candidacy or entrance to particular majors because of space limitations. After a student is admitted as a degree candidate, the dean of the college or school of enrollment decides which credits earned as a nondegree student may be used to fulfill degree requirements.

REENROLLMENT

A student who was once admitted and enrolled as a degree candidate and wants to resume study is required to apply for reenrollment consideration under the conditions specified in Faculty Senate Policy 58-00.

An application for reenrollment can be obtained by writing to the Office of the University Registrar, The Pennsylvania State University, 112 Shields Building, University Park, PA 16802-1292; (814) 865-6357, or by contacting the Registrar's office at any University location. The form is also available at **www.psu.edu/registrar** on the Web. It is recommended that applications be submitted to the Office of the University Registrar at least one month before registration.

REINSTATEMENT

A student who has been dropped from the University for unsatisfactory scholarship or who has been dismissed from the University for nonacademic reasons must be reinstated under the conditions specified in Faculty Senate Policy 54-80 in order to be re-enrolled. To initiate a reinstatement petition, the student should contact the dean of the college or school where enrollment is desired.

In addition to the request for reinstatement, the student must complete an application for reenrollment (see **www.psu.edu/registrar**) and submit it to the Office of the University Registrar, The Pennsylvania State University, 112 Shields Building, University Park, PA 16802-1292.

LEAVE OF ABSENCE

A student who is a candidate for an associate or baccalaureate degree may apply for a leave of absence for a period not to exceed one year. Faculty Senate Policy 54-70 applies. Under special circumstances, a leave of absence may be approved for a maximum of two years. A student who fulfills the conditions of an approved leave of absence may register upon return without applying for re-enrollment. Once submitted, the leave-time periods are not permitted to be altered. A student is permitted to advance register for the semester in which he or she is returning. An application for leave of absence and additional information can be obtained from the student's college of enrollment and is processed at the college dean's office. The form is also available at **www.psu.edu/registrar** on the Web.

A student who wants to interrupt study at the University to study at another institution during a semester other than the summer may request a leave of absence for this purpose. It is not necessary to obtain a leave of absence if the period of study at another institution will be limited to the summer and the student returns for the fall semester. A student planning to study elsewhere should consult with his or her academic adviser to determine the applicability of such work to the program of study. In addition, the student should contact the Undergraduate Admissions Office to determine if transfer credit is possible. The student should be cognizant of the University regulations on residence requirements and of any special requirements of the particular major. When courses are completed at another institution and an evaluation for possible transfer credit is desired, an official transcript must be submitted directly to the Undergraduate Admissions Office by the registrar of the other institution. An evaluation fee of $5 is required.

OPPORTUNITIES FOR CREDIT ACQUISITION

Course credits may be acquired by instruction as definedin Policy 42-23 in Policies and Rules; by examination as discussed below; by transfer from other regionally accredited colleges and universities as discussed under the heading Admission with Advanced Standing; by transfer from colleges and universities outside the United States as defined in Policy 42-84 in *Policies and Rules*; by validation from colleges and universities that are not regionally accredited but award associate degrees or higher as defined in Policy 42-86 in *Policies and Rules*; by educational experiences in the Armed Services as defined in Policy 42-98 in *Policies and Rules*; and by educational credit for Training Programs in Noncollegiate Organizations as defined in Policy 42-99 in *Policies and Rules.* Additional information about credit acquisition can be obtained by writing to the Undergraduate Admissions Office, The Pennsylvania State University, 201 Shields Building, Box 3000, University Park, PA 16 804-3000; 814-865-5471, or by contacting an admissions officer at any University location.

APPLICATION OF ASSOCIATE CREDITS TOWARD A BACCALAUREATE DEGREE

Students can begin most Penn State baccalaureate degree programs at any location. Depending on the final choice of major, degree (associate or baccalaureate), and location preference, students may stay at one campus throughout their entire Penn State experience or they may attend one campus for the first two years and then relocate.

Colleges at University Park that offer programs leading to associate and/or baccalaureate degrees are: College of Agricultural Sciences, College of Arts and Architecture, The Mary Jean and Frank P. Smeal College of Business Administration, College of Communications, College of Earth and Mineral Sciences, College of Education, College of Engineering, College of Health and Human Development, College of the Liberal Arts, and the Eberly College of Science. The School of Information Sciences and Technology offers associate and baccalaureate degrees that may be completed at many Penn State campuses.

At locations throughout the Commonwealth: Abington College; Altoona College; Berks-Lehigh Valley College; Capital College; Penn State Erie, The Behrend College; and the Commonwealth College. The Pennsylvania College of Technology, an affiliate of Penn State in Williamsport, provides students with opportunities to participate in selected programs.

APPLICATION OF ASSOCIATE DEGREE CREDITS TOWARD A BACCALAUREATE DEGREE AT THE UNIVERSITY PARK CAMPUS—Credits received for associate degree program courses may be applicable to a particular baccalaureate degree program listed in the current this bulletin at the discretion of the appropriate college and major department.

APPLICATION OF ASSOCIATE DEGREE CREDITS TOWARD A BACCALAUREATE DEGREE AT PENN STATE ERIE, THE BEHREND COLLEGE—Graduates of associate degree majors may also qualify for reenroll-

ment to a variety of baccalaureate degree majors at Penn State Erie. Students interested in applying to Penn State Erie should contact that college's Registrar's Office or talk with the Penn State Erie representative at their campus.

Graduates of associate degree majors in either Business Administration or Computer Science may want to continue study in one of the following baccalaureate degree majors at Penn State Erie: Accounting; Business Economics; Business, the Liberal Arts, and Science; Management; or Management Information Systems. Students graduating with a two-year degree in Letters, Arts, and Sciences may want to consider any of a large number of majors offered by Penn State Erie in the liberal arts, sciences, and business.

Graduates of associate degree majors in Biomedical Engineering Technology, Electrical Engineering Technology, and Telecommunications Technology may want to continue their education in the baccalaureate degree major in Electrical Engineering Technology or a business discipline. Students receiving an Associate in Engineering Technology degree in Mechanical Engineering Technology or Architectural Engineering Technology (including General and Building Environmental Systems Technology options) may want to continue study in a baccalaureate degree major in either Mechanical Engineering Technology or a business program. Recipients of an associate degree in Plastics Engineering Technology may want to continue study for a baccalaureate degree in that same field or in a business discipline.

APPLICATION OF ASSOCIATE DEGREE CREDITS TOWARD A BACCALAUREATE DEGREE AT PENN STATE HARRISBURG—In addition to receiving an education to prepare for employment, the graduate of an associate degree program may also qualify for admission to various programs leading to a baccalaureate degree from Penn State Harrisburg. Those anticipating admission to Penn State Harrisburg should inquire at that college's admissions office late in their freshman year or early in their sophomore year concerning baccalaureate degree course requirements.

Graduates of the associate degree majors in Architectural Engineering Technology, Biomedical Engineering Technology, Electrical Engineering Technology, Materials Engineering Technology, Mechanical Engineering Technology, Surveying Technology, and Telecommunications Technology may want to consider continuing at Penn State Harrisburg in an engineering technology major leading to a bachelor of science degree in engineering technology or engineering. Majors are offered in Electrical Engineering Technology, Electrical Engineering, Environmental Engineering, Mechanical Engineering Technology, and Structural Design and Construction Engineering Technology.

Associate degrees in the following majors are also acceptable toward admission to baccalaureate degree majors at Penn State Harrisburg: Forest Technology; Hotel, Restaurant, and Institutional Management; Letters, Arts, and Sciences; Medical Laboratory Technology; and Sociology. Penn State Harrisburg programs related to these majors are offered by the college's School of Humanities, School of Behavioral Science and Education, and School of Public Affairs.

Graduates of the associate degree majors in Science and in Computer Science may want to consider admission to the baccalaureate degree major in Mathematical Sciences at Penn State Harrisburg.

APPLICATION OF ASSOCIATE DEGREE CREDITS TOWARD A BACCALAUREATE DEGREE AT OTHER PENN STATE LOCATIONS—Graduates of associate degree majors also may qualify for admission to some baccalaureate degree programs at other Penn State locations. For information about offerings at the various Penn State locations, see Penn State Degree Programs Summary on the Penn State Registrar's Web site: **www.psu.edu/registrar**.

OPPORTUNITIES FOR CREDIT ACQUISITION BY EXAMINATION

THE ADVANCED PLACEMENT PROGRAM OF THE COLLEGE BOARD—The University cooperates with the College Board in this program. Credit may be awarded for Advanced Placement Examinations depending upon the grade earned on the examination and other factors as indicated in the following paragraphs.

A student who does advanced work in high school may take Advanced Placement Examinations that are based on college-level studies. The schedule of credit awarded for an individual's performance on the examinations is listed below. For some examinations, the amount of credit awarded varies with an earned grade of three, four, or five. If credit is awarded, a student's University record will carry notation of credit, but no grade will be recorded. Credit acquired in this manner does not affect a student's grade-point average at the University.

Limitations of credit earned through the Advanced Placement Examinations are as follows: (a) the credit must be useful in a student's program of study; (b) duplicate credit in the same subject is not awarded in any case; and (c) credit may be awarded only to a student who is a candidate for a degree at this University.

General credit may be awarded for an Advanced Placement Examination covering material that is not the substantial equivalent of material covered in a specific University course. General credits may be used to fulfill degree requirements in any area; their use is not necessarily limited to general education or elective requirements. General credits are applied to a student's program of study in accordance with the procedures established by the college or other degree-granting unit of enrollment. Information about the use of general credits or specific course credits earned by Advanced Placement Examinations in individual programs of study may be obtained from a student's academic adviser or from the office of the dean of a student's college or school.

Undergraduate students interested in receiving credit for Advanced Placement Examinations should arrange for their official grade reports to be sent directly from Educational Testing Service (ETS) to the Undergraduate Admissions Office, which is responsible for evaluating such reports and awarding credit.

The schedule of credit awarded for Advanced Placement Examinations may be revised as a result of periodic review by the faculty.

Current information about credit awarded by Penn State can be obtained from the Undergraduate Admissions Office, The Pennsylvania State University, 201 Shields Building, Box 3000, University Park PA 16804-3000; 814-865-5471; on the Web: **www.psu.edu/admissions.**

SCHEDULE OF CREDIT AWARDED FOR ADVANCED PLACEMENT EXAMINATIONS

Art: History of Art—For a grade of three, four, or five, credit is awarded for ART H 100 (3 credits).

Art: Studio Drawing—For a grade of three, four, or five, credit is awarded for ART 120 (3 credits).

Art: 2-D Design—For a grade of three, four, or five, 3 general credits of studio art are awarded.

Art: 3-D Design—For a grade of three, four, or five, 3 general credits of studio art are awarded.

Biology—For a grade of three, no credit is awarded. For a grade of four, credit is awarded for BIOL 011 and 012 (4 credits). For a grade of five, credit is awarded for BIOL 110 (4 credits). No credits awarded for BIOL 220, 230, and 240.

Chemistry—For a grade of three, no credit is awarded. For a grade of four or five, credit is awarded for CHEM 012 and 013 (6 credits), as well as one additional credit in CHEM 014.

Computer Science A—For a grade of three or four, no credit is awarded. For a grade of five, credit is awarded for CMPSC 101 (3 credits).

Computer Science AB—For a grade of three, no credit is awarded. For a grade of four or five, credit is awarded for CSE 103 (4 credits).

Economics: Macroeconomics—For a grade of three, no credit is awarded. For a grade of four or five, credit is awarded for ECON 004 (3 credits).

Economics: Microeconomics—For a grade of three, no credit is awarded. For a grade of four or five, credit is awarded for ECON 002 (3 credits).

English: Language and Composition—For a grade of three, four, or five, no credit is awarded. With a grade of four or five, a student is invited to schedule ENGL 030—Honors Freshman Composition.

English: Literature and Composition—For a grade of three, no credit is awarded. For a grade of four or five, credit is awarded for ENGL 001 (3 credits).

Environmental Science—For a grade of three, four, or five, credit is awarded for ERM 210 (3 credits).

French Language—For a grade of three, 12 general credits of French are awarded. For a grade of four, an additional 4 general credits of language at the 200 level are awarded (total of 16 credits). For a grade of five, an additional 4 general credits of language at the 200 level are awarded (total of 20 credits). For a grade of three or above, the student is considered as having fulfilled the 12th-credit-level foreign language requirement.

French Literature—For a grade of three, no credit is awarded. For a grade of four or five, 3 general credits of French literature at the 300 level are awarded.

German Language—For a grade of three, 12 general credits of German are awarded. For a grade of four, an additional 4 general credits of language at the 200 level are awarded (total of 16 credits). For a grade of five, an additional 3 general credits of language at the 300 level are awarded (total of 19 credits) if the student enrolls in a regular 300-level course. The extra credit would be awarded the semester after completion of the regularly enrolled course. For a grade of three or above, the student is considered as having fulfilled the 12th-credit-level foreign language requirement.

Government and Politics: United States—For a grade of three, no credit is awarded. For a grade of four or five, credit is awarded for PL SC 001 (3 credits).

Government and Politics: Comparative—For a grade of three, no credit is awarded. For a grade of four or five, credit is awarded for PL SC 003 (3 credits).

History: American History—For a grade of three, no credit is awarded. For a grade of four or five, credit is awarded for HIST 020 and 021 (6 credits).

History: European History—For a grade of three, no credit is awarded. For a grade of four or five, credit is awarded for HIST 002 (3 credits).

History: World—For a grade of three, no credit is awarded. For a grade of four or five, credit is awarded for HIST 011 (3 credits).

Human Geography—For a grade of three, four, or five, credit is awarded for GEOG 020 (3 credits).

International English Language—No credit is awarded for this examination. A grade of four or five satisfies the University's English language proficiency requirement.

Latin: Literature—For a grade of three, four, or five, 4 general credits of Latin are awarded.

Latin: Virgil—For a grade of three, four, or five, 4 general credits of Latin are awarded.

Mathematics: Calculus AB—For a grade of three, no credit is awarded. For a grade of four or five, credit is awarded for MATH 140 (4 credits).

Mathematics: Calculus BC—For a grade of three, credit is awarded for MATH 140 (4 credits). For a grade of four or five, credit is awarded for MATH 140 (4 credits) and MATH 141 (4 credits).

Music: Theory—For a grade of three, four, or five, credit is awarded for MUSIC 008 (3 credits).

Physics B—For a grade of three no credit is awarded. For a grade of four or five, credit is awarded for PHYS 250 and 251 (8 credits).

Physics C: Mechanics—For a grade of three, no credit is awarded. For a grade of four or five, credit is awarded for PHYS 211 (4 credits).

Physics C: Electricity and Magnetism—For a grade of three, no credit is awarded. For a grade of four or five, credit is awarded for PHYS 212 (4 credits).

Psychology—For a grade of three, no credit is awarded. For a grade of four or five, credit is awarded for PSY 002 (3 credits).
Spanish Language—For a grade of three, 8 general credits of Spanish are awarded. For a grade of four or five, 12 general credits of Spanish are awarded, and the student will be considered as having fulfilled the 12th-credit-level language requirement.
Spanish Literature—For a grade of three, no credit is awarded. For a grade of four or five, 3 general credits of Spanish literature at the 300 level are awarded.
Statistics—For a grade of three, credit is awarded for STAT 100 (3 credits). For a grade of four or five, credit is awarded for STAT 200 (4 credits).

THE COLLEGE-LEVEL EXAMINATION PROGRAM OF THE COLLEGE BOARD—The University cooperates with the College Board in this program, referred to as CLEP. Credit may be awarded for the CLEP Examinations depending upon the score earned on the examination and other factors as indicated in the following paragraphs.

An undergraduate student who is a candidate for a degree at the University and who has earned a score equivalent to the fiftieth percentile or higher for performance on a CLEP Examination, taken before or after admission to degree candidacy, may receive credit as indicated in the schedule of credits listed below. The student's University record will carry notation of credit, but no grade will be awarded.

Limitations of credit earned through the CLEP Examinations are as follows: (a) the credit must be useful in a student's program of study; (b) duplicate credit in the same subject is not awarded in any case; and (c) the total number of credits that may be awarded is limited to 60 credits.

General credit may be awarded for a CLEP Examination covering material that is not the substantial equivalent of material covered in a specific University course. General credits may be used to fulfill degree requirements in any area; their use is not necessarily limited to General Education or elective requirements. General credits are applied to a student's program of study in accordance with the procedure established by the college or school of enrollment. Information about the use of general credits or specific course credits earned by CLEP Examinations in individual programs of study can be obtained from a student's academic adviser or from the office of the dean of a student's college or school.

Undergraduate students interested in receiving credit for CLEP Examinations should arrange for their official score reports to be sent directly from Educational Testing Service (ETS) to the Undergraduate Admissions Office, which is responsible for evaluating such reports and awarding credit.

The schedule of credit awarded for CLEP Examinations may be revised as a result of periodic review by the faculty.

Current information about credit awarded by Penn State can be obtained from the Undergraduate Admissions Office, The Pennsylvania State University, 201 Shields Building, Box 3000, University Park, PA 16804-3000; 814-865-5471.

SCHEDULE OF CREDIT AWARDED FOR CLEP EXAMINATIONS
All examination scores must be equivalent to fiftieth percentile or higher.

General Examinations	*University Credit*	
English Composition	No credit	
Humanities	Humanities	3 gen.
Mathematics	Mathematics	3 gen.
Natural Sciences	SC Natural Science	3 gen.
Social Sciences and History	SO SC 002 Contemporary Society	3
Subject Examinations		
Business		
Information Systems & Computer Applications	CMPSC 100 Computer Fndmtl & Applics	3
Principles of Accounting	ACCTG Introductory Accounting	3 gen.
Introductory Business Law	BLAW Introductory Bus Law	3 gen.
Principles of Management	MGMT Introduction to Management	3 gen.
Principles of Marketing	MKTG Introductory Martketing	3 gen.
Composition and Literature		
American Literature	No credit	
Analysis and Interpretation of Literature	No credit	
Freshman College Composition (replaces College Composition and Freshman English)	No credit	
English Literature	No credit	
Foreign Languages		
College French—Level 1	FR 001 Elementary French	4
College French—Level 1	FR 001, 002 Elementary French	8
College French—Level 2	FR 001, 002, 003 Elem & Intermed Fr	12

College German—Level 1	GER 001 Elementary German	4
College German—Level 1	GER 001, 002 Elementary German	8
College German—Level 2	GER 001, 002, 003 Elem & Intermed Ger	4
College Spanish—Level 1	SPAN 001 Elementary Spanish	4
College Spanish—Level 1	SPAN 001, 002 Elementary Spanish	8
College Spanish—Level 2	SPAN 001, 002, 003 Elem & Intermed Span	12
History and Social Sciences		
American Government	PLSC Political Science	3 gen.
American History I: Early Colonization to 1877	No credit	
American History II: 1865 to the Present	No credit	
Introduction to Educational Psychology	EDPSY Educational Psychology	3 gen.
Introductory Psychology	PSY General Psychology	3 gen.
Human Growth and Development	PSY Human Growth & Development	3 gen.
Principles of Macroeconomics	ECON 004 (GS) Intro Macro Analys & Pol	3
Principles of Microeconomics	ECON 002 (GS) Intro Micro Analys & Pol	3
Introductory Sociology	SOC 001 (GS) Intro Sociology	3
Western Civilization I: Ancient Near East to 1648	HIST 001 (GH) Western Hertiage I	3
Western Civilization II: 1648 to the Present	HIST 002 (GH) Western Heritage II	3
Science and Mathematics		
Calculus with Elementary Functions**	MATH 140 (GQ) Calc/Analtyic Geom I	4
College Algebra	MATH 021 (GQ) College Algebra I	3
College Algebra	MATH 021 (GQ), 022 (GQ) College Algebra I & II & Analytic Geometry	6
College Algebra—Trigonometry	MATH 040 Algebra, Trig, & Analyt Geom	5
General Biology	No credit	
General Chemistry	No credit	
Trigonometry	MATH 026 (GQ) Plane Trigonometry	3

**Essay section of this examination is required.

INTERNATIONAL SECONDARY SCHOOLING

1. *Foreign Secondary Schooling*—A person who does advanced work in a secondary school in another country may receive consideration for transfer credit when the examinations taken are based on college-level studies.

Credit may be awarded for advanced work in foreign secondary schools. The World Education Series, published by the American Association of Collegiate Registrars and Admissions Officers, shall be used as a guide in making decisions on the awarding of credit for course work completed at an advanced level in foreign secondary schools. The number of credits awarded will reflect the introductory sequence in that subject at Penn State.

Limitations of credit earned through review of advanced level foreign secondary schooling are as follows: (a) the credit must be useful in the student's program of study; (b) duplicate credit in the same subject is not awarded in any case; (c) a student who is not a degree candidate must have enrolled and completed at least one course of 3 credits or more at Penn State before any credit appears on the student record.

A student interested in receiving credit for advanced-level foreign secondary schooling should arrange for an official grade report to be sent directly from the secondary school or the examining board to the Undergraduate Admissions Office. The Undergraduate Admissions Office is responsible for evaluating such reports and awarding credit.

If credit is awarded, the student's University record carries notation of credits, but no grade is recorded. Credit awarded in this manner does not affect the student's grade-point average at this university.

2. *International Baccalaureate*—A person who does work based on college-level studies in an International Baccalaureate program in a secondary school may take the Higher Level examinations.

Credit may be awarded for Higher Level examinations of the International Baccalaureate depending upon the grades earned on the examination. Subjects examined at the Higher Level with an earned grade of 5 or higher will be considered for transfer credit. The number of credits awarded will reflect the introductory sequence in that subject at Penn State.

Limitations of credit earned through the Higher Level examinations are as follows: (a) the credit must be useful in the student's program of study; (b) duplicate credit in the same subject is not awarded in any case; (c) a student who is not a degree candidate must have enrolled and completed at least one course of three credits or more at Penn State before any credit appears on the student record.

A student interested in receiving credit for the Higher Level examinations of the International Baccalaureate program should arrange for an official grade report to be sent directly from the secondary school to the Undergraduate Admissions Office. The Undergraduate Admissions Office is responsible for evaluating such reports and awarding credit.

If credit is awarded, the student's University record carries notation of credits, but no grade is recorded. Credit awarded in this manner does not affect the student's grade-point average at this university.

PLACEMENT POLICY FOR PENN STATE FOREIGN LANGUAGE COURSES—All students interested in studying a foreign language at Penn State may choose either to continue the language studied previously or to begin a new one. To continue with a language, students must follow the placement policy as outlined here.

Placement Policy—Students who have studied a foreign language within four years immediately before admission to college may enroll in that language for credit based on the number of Carnegie units obtained prior to admission. (A Carnegie "unit" refers to one course level of a foreign language—French 1, French 2, French 3, etc.—equivalent to one year of study and accredited as such by the school.) If a period of four or more years has elapsed between a student's graduation from high school and admission to college, he/she may be eligible to enroll in level 1 of the language studied in high school.

Units of Study CompletedPrior to Admission to College	*Register in Penn State Language Level*
Fewer than two	Course Level 001 (4 cr.)
Two or three	Course Level 002 (4 cr.)
Four or more	Course Level 003 (4 cr.)

Students may choose to audit a lower level course than the level they place into, but may *not* receive credit for it. Students who believe they are qualified for a more advanced course may take a placement exam offered a few days after the beginning of each semester.

Non-Course Work Knowledge of Foreign Languages—Students who have acquired a knowledge of a foreign language by means other than course work (e.g., family background, travel or study in a foreign country, participation in noncredit summer language programs, etc.) may enroll in elementary and intermediate courses in that language only with permission of the course coordinator or department head. Once students have been placed in a skills course, they may not receive credit for a lower-level skills course.

Students whose native language is something other than English *may not* receive credit (through course work or examination) for elementary and intermediate courses in their native language. Enrollment in skills courses beyond intermediate level (e.g., conversation, composition) must be approved by the department head.

Accelerated and Intensive Courses—Students may choose to enroll in accelerated courses such as French 111 and 112, German 011 and 012, or in Penn State's Summer Intensive Language Institute courses. Because the objectives of these courses are somewhat different, students may schedule them for full credit even if they have studied the language previously.

Credit by Examination/Proficiency Examination (Senate Policy 42-50)—Credit by Examination (graded, tuition charged) and Credit by Undergraduate Proficiency Examination (ungraded, no tuition) are available to the extent allowed by this placement policy. For example, a student who has two units of secondary school foreign language and chooses to begin study of that language at the third level instead of the second (Course Level 003, 4 cr.), may receive credits for the second level (Course Level 002, 4 cr.), but not for the first level (Course Level 001, 4 cr.).

Questions—Questions should be addressed to the course coordinator or department head of the particular language department concerned.

UNDERGRADUATE PROFICIENCY EXAMINATIONS FOR PLACEMENT AND CREDIT—Proficiency examinations are offered by the University for a number of courses normally taken by students during their first four semesters. Students are encouraged and in some cases required to take these regularly scheduled examinations in those areas in which (a) they have had prior experience or education, or (b) they have had successful high school experience.

Credit may be awarded only for specific courses offered by the University in which the student demonstrates a competency on the proficiency examination at least equivalent to a grade of C, and only if the candidate has not already received credit for the course, or equivalent course credit under the College Board's Advanced Placement Program, College-Level Examination Program, or by transfer from another institution. Credit by proficiency examination shall not be granted for any course that the candidate has previously failed.

When credit is awarded for satisfactory performance on a proficiency examination a symbol of S, together with the number of credits granted, is entered on the candidate's academic record.

Provisional degree and nondegree students may take examinations required by a department for initial placement in a course or course sequence. However, any credit earned is not entered on the student's record until the student is admitted to the University as a degree candidate.

Proficiency examinations may be offered as follows:

Arabic Language Proficiency Examinations—Available to students who already have some competence in Arabic. Students may receive up to 12 credits in elementary/intermediate Arabic.

Chemistry Proficiency Examinations—Required of all students who intend to enroll in the general chemistry program to determine their proper starting level. Students who perform satisfactorily are admitted to CHEM 012 (DN) for 3 credits. (Enrollment in CHEM 012 (DN) also requires an adequate knowledge of algebra, as indicated by the results of the algebra portion of the mathematics proficiency examination.) Students who do very well on the test will be offered an opportunity to take an additional examination to attempt the exemption of CHEM 012 (DN). Satisfactory performance on this latter examination entitles the student to 3 credits for CHEM 012 (DN), admis-

sion to CHEM 013 (DN), and permission to take another examination to attempt the exemption of CHEM 013 (DN). Students who show a deficiency in their chemistry background will be enrolled in CHEM 012 (DN) for 4 credits. Those who have not had previous experience in chemistry or who do very poorly on the proficiency examination will be required to take CHEM 011 or CHEM 017 (DN).

Chinese Language Proficiency Examinations—Available to students who already have some competence in Chinese. Students may receive up to 12 credits in elementary/intermediate Chinese.

English Proficiency Examinations—Required of all entering students to determine their proper starting level. Students whose test scores indicate substantial weakness must enroll in ENGL 004, successful completion of which is a prerequisite for ENGL 015 (GWS). Students with superior scores may enroll in ENGL 015 (GWS) or take an essay examination to qualify for admission to ENGL 030 (GWS), Honors Freshman Composition.

French Language Proficiency Examinations—Available to students who already have some competence in French. Based on their examination performances and the number of high school units completed in the language, students may receive up to 12 credits in elementary/intermediate French.

German Language Proficiency Examinations—Available to students who already have some competence in German. Based on their examination performances and the number of high school units completed in the language, students may receive up to 12 credits in elementary/intermediate German.

Hebrew Language Proficiency Examinations—Available to students who already have some competence in Hebrew. Students may receive up to 12 credits in elementary/intermediate Hebrew.

Italian Language Proficiency Examinations—Available to students who already have some competence in Italian. Based on their examination performances and the number of high school units completed in the language, students may receive up to 12 credits in elementary/intermediate Italian.

Japanese Language Proficiency Examinations—Available to students who already have some competence in Japanese. Students may receive up to 12 credits in elementary/intermediate Japanese.

Korean Language Proficiency Examinations—Available to students who already have some competence in Korean. Students may receive up to 12 credits in elementary/intermediate Korean.

Latin Language Proficiency Examinations—Available to students who already have some competence in Latin. Based on their examination performances and the number of high school units completed in the language, students may receive up to 12 credits in elementary/intermediate Latin.

Mathematics Proficiency Examinations—All students will be required to take a mathematics examination that includes algebra and trigonometry. This examination is used to place students in college algebra, trigonometry, precalculus, and calculus courses. Students are required to start in the appropriate course in this sequence. Those students who have had some calculus in high school will be offered the opportunity to take an examination in calculus. Satisfactory performance on this latter examination entitles the student to credit for calculus courses.

Russian Language Proficiency Examinations—Available to students who already have some competence in Russian. Based on their examination performances and the number of high school units completed in the language, students may receive up to 12 credits in elementary/intermediate Russian.

Spanish Language Proficiency Examinations—Available to students who already have some competence in Spanish. Based on their examination performances and the number of high school units completed in the language, students may receive up to 12 credits in elementary/intermediate Spanish.

Swahili Language Proficiency Examinations—Available to students who already have some competence in Swahili. Students may receive up to 12 credits in elementary/intermediate Swahili.

CREDIT BY EXAMINATION IN OTHER COURSES—A student who has acquired substantial knowledge in a subject area may apply to the appropriate academic department for permission to take an examination in a specific subject. Credits earned by examination may be granted only when the student earns a grade of C or better on the examination. A fee of $30 for each credit is charged for such examinations. Permission to acquire credit in this manner shall be by authorization of the student's dean, director of the Division of Undergraduate Studies (if the candidate is enrolled in that division), or campus Director of Academic Affairs at locations other than University Park campus, and of the head of the department in which the course is taught. Such authorization may not be granted for the purpose of acquiring credit for a course previously failed. A student must have enrolled and completed at least one course of 3 credits at Penn State before any credit earned appears on the student record. Credit by examination may not be attained on a Satisfactory–Unsatisfactory basis.

ESTIMATED TUITION, ROOM, BOARD, AND OTHER CHARGES

NOTE: The University reserves the right to revise tuition, room, board, and other charges without further notice. Tuition and charges for graduate programs are listed in the *Graduate Degree Programs Bulletin*. Penn State has two semesters and a summer session. Students typically attend two semesters per year.

All current tuition information is accessible at www.tuition.psu.edu. Please go to that site for all information concerning tuition. For information concerning room and board and specific charges, see those items in the bulletin or go to www.bursar.psu.edu and click on the appropriate links.

RESIDENCY CLASSIFICATION FOR TUITION PURPOSES

PENNSYLVANIA CLASSIFICATION

A student shall be classified as a Pennsylvania resident for tuition purposes if that student has a Pennsylvania domicile and that student's presence in Pennsylvania is not primarily for educational purposes. Domicile is a person's existing and intended fixed, permanent, and principal place of residence. A student whose presence in the Commonwealth is primarily for educational purposes shall be presumed to be a non-Pennsylvania resident for tuition purposes. The following are considerations that may be used by the University in determining whether a student is a resident for tuition purposes:

1. A student under the age of 21 is presumed to have the domicile of his/her parent(s) or legal guardian(s), unless the student has maintained continuous residence in the Commonwealth for other than educational purposes for a period of at least 12 months immediately prior to his/her initial enrollment at The Pennsylvania State University, and, the student continues to maintain such separate residence.
2. A student who has resided in the Commonwealth for other than educational purposes for at least a period of 12 months immediately preceding his/her initial enrollment at The Pennsylvania State University is presumed to have a Pennsylvania domicile.
3. A student who has not resided continually in Pennsylvania for a period of 12 months immediately preceding his/her initial enrollment at The Pennsylvania State University is presumed to have a non-Pennsylvania domicile.
4. A student requesting to be classified as a Pennsylvania resident for tuition purposes must be a citizen of the United States or a permanent resident. Permanent residents must have received the I-551 stamp approving their permanent resident status. An individual in a nonimmigrant status with the INS is not eligible for classification as a Pennsylvania resident for tuition purposes. Other extraordinary circumstances, which may qualify a student as a Pennsylvania resident for tuition purposes, will be considered on a case-by-case basis.
5. A United States government employee or member of the armed forces who was a resident of Pennsylvania immediately preceding his/her entry into government service and who has continuously maintained Pennsylvania as his/her domicile will be presumed to have a Pennsylvania domicile. Military personnel and their dependents who are assigned to an active duty station in Pennsylvania and who reside in Pennsylvania shall be charged in-state tuition rates.
6. A student receiving a scholarship, guaranteed loan, grant, or other form of financial assistance dependent upon residence in a state other than Pennsylvania is not a Pennsylvania resident for tuition purposes.

RECLASSIFICATION AS PENNSYLVANIA RESIDENT

A student requesting reclassification as a Pennsylvania resident for tuition purposes must demonstrate by clear and convincing evidence that his/her domicile is in Pennsylvania, and that his/her presence in Pennsylvania is not primarily for educational purposes. Each request shall be decided individually on the basis of all facts submitted by the petitioner. Accordingly, it is not possible to list a specific combination of factors or set of circumstances which, if met, would ensure reclassification for tuition purposes.

RECLASSIFICATION PROCEDURE

1. A student may challenge his/her residence classification by filing a written petition with the person or committee designated to consider such challenges at the University. Such person or committee shall consider such petition and render a timely decision that shall constitute an exhaustion of administrative remedies.
2. Any reclassification resulting from a student's challenge or appeal shall be effective at the beginning of the semester or session during which the challenge or appeal was filed or at the beginning of the following semester or session. The decision as to which semester or session becomes the effective date shall rest with the person or committee rendering the decision on reclassification.
3. A student who changes his/her place of residence from Pennsylvania to another state is required to give prompt written notice of this change to the University and shall be considered for reclassification as a non-Pennsylvanian for tuition purposes effective with the date of such change.
4. A dependent resident student whose parent(s) or legal guardian(s) move outside of the Commonwealth may remain a Pennsylvania resident for tuition purposes if he/she continues to maintain a separate domicile within the Commonwealth.

NONRESIDENT STUDENT CLASSIFICATION

A. A student is initially classified as a nonresident based on information provided by the student when applying for admission to the University. The initial classification is made as follows:

1. Undergraduate Student
   a. Penn State Harrisburg–Penn State Harrisburg Academic Services Officer
   b. All other locations–Undergraduate Admissions Office, The Pennsylvania State University, University Park, PA 16804-3000.
2. Graduate Student
   a. Penn State Harrisburg–Penn State Harrisburg Academic Services Officer
   b. All other locations–Dean of the Graduate School
3. Medical Student—Office of Student Affairs, Penn State Hershey Medical Center

B. A student may challenge his/her residency classification by filing a written petition as follows:

1. Undergraduate Student
   a. Penn State Harrisburg–Penn State Harrisburg Financial Officer
   b. All other locations–Residency Appeal Officer, University Park
2. Graduate Student
   a. Penn State Harrisburg–Penn State Harrisburg Financial Officer
   b. All other locations–Residency Appeal Officer, University Park
3. Medical Student—Controller, Penn State Hershey Medical Center

C. The appropriate University official reviews the student's petition and makes a decision.

D. The student may appeal that officer's residency decision to the University Appeals Committee on Residence Classification having representation from the Corporate Controller's Office, Undergraduate Admissions Office, and the Graduate School. The committee's decision on appeal shall be final.

PLEASE NOTE: A page of frequently asked questions concerning residency classification for tuition purposes can be found at **www.fis.psu.edu/fo/FAQ-Residency.htm.**

ROOM AND BOARD

APPLYING FOR ON-CAMPUS ACCOMMODATIONS AT UNIVERSITY PARK CAMPUS—The University requires a housing deposit of $100 from all students when they are submitting a Housing and Food Services contract for residence hall space. First-year students who are accepting admittance must submit their $100 enrollment fee and $100 general deposit with the acceptance card, and return the acceptance card and the Housing and Food Services contract with a check for $300 (total amount for the housing deposit, enrollment fee, and general deposit). (Consult the admittance packet for deadlines as well as cancellation and refund policies.) First-year students at University Park campus are required to live on campus as follows: First-year students admitted for summer session are obligated to live in the University residence halls during summer session, fall semester, and spring semester; first-year students admitted for fall semester are obligated to live in the residence halls fall and spring semesters; first-year students admitted for spring semester are obligated to live in the residence halls for spring semester. First-year students may apply for an exception to this requirement before submitting a housing contract if they are 21 years of age, living at home with parents, guardians, or close relatives, or are veterans. Students living on campus are required to have a meal plan. Slightly less than 25 percent of sophomores, juniors, and seniors live on campus. The majority of these students often live off campus, in the State College community. Continuing students will apply through an on-line process (contact Housing and Food Services for more information; see **www.hfs.psu.edu**). All students who enter the request process may not receive a contract, depending on demand and space available.

APPLYING FOR ON-CAMPUS ACCOMMODATIONS AT OTHER PENN STATE LOCATIONS—At Penn State campuses that offer on-campus housing options, housing space is limited and freshmen are not required to live on campus. Housing is available on a first-come, first-served basis, and those interested should request a housing contract as quickly as possible from the Housing and Food Services office at that location. Students living on campus are required to have a meal plan. Returning students may request housing contracts through the same online process as University Park students. Not all students requesting on-campus housing will receive on-campus accommodations.

OFF-CAMPUS ACCOMMODATIONS—Students who do not live on campus in the University residence halls find accommodations in apartments or in private homes. Cost for rooms and apartments varies with the type of accommodations. Diners Club and A La Board meals are available for off-campus students.

Most students who join fraternities live and eat in the fraternity houses. The cost varies according to the individual fraternity.

ROOM CHARGES FOR UNDERGRADUATES, all campuses, each semester, fall 2003 and spring 2004:
Standard Double: $1,540 Standard Triple: $1,375
Standard Single: $1,930 Standard Quad: $1,375
Standard Regular Double Suite: $1,815
For room sizes other than standard, see **www.bursar.psu.edu/roomboard.cfm**

Note: Undergraduate residence hall and suite building students are required to select a meal plan from the six available options each semester.
A LA BOARD MEAL PLANS
Plan 1: $1,325 Plan 4: $1,500
Plan 2: $1,380 Plan 5: $1,550
Plan 3: $1,430 Plan 6: $1,675

See **www.bursar.psu.edu/roomboard.cfm** for current rates, summer rates, and housing options at all locations.

GENERAL DEPOSIT

All undergraduate students are required to make a general deposit of $100 at the time of admission, which will serve to safeguard the property and equipment used by students in their work and to comply with University contracts. It will be retained until a student withdraws or graduates.

The deposit, less any charges, will be refunded early in the subsequent semester to the student who has withdrawn or graduated.

For the quickest delivery of refunds, students must enroll in Penn State's Rapid Refund Program by selecting "Refund Information" on eLion at http://eLion.psu.edu. Student refunds can be electronically deposited into their back accounts by clicking on the "Sign Up for Rapid Refund" button.

If a student chooses to have his/her refund mailed to a home or local address, the delivery of this refund will be delayed.

SPECIFIC CHARGES

In addition to tuition, technology fee, activity fee, and the General Deposit, the following specific charges shall apply under special conditions and shall be paid independently of regular tuition and charges. Visit the Bursar's Web site at **www.bursar.psu.edu** for the most current information. These charges are subject to change without notice.

Application fee $50	
Change of schedule—each course processed as either a late add or late drop	6
Credit by examination—each credit	30 ($35 for Nursing)
Duplicate student identification and activity card—each	15
Enrollment fee—freshman upon acceptance of admission	100
Ph.D. dissertation fee	870
Privilege of late payment	25
Privilege of late registration	10
Reinstatement fee	35
Returned item fee	25
*Transcript of records	
Official—each copy	6
Unofficial—per copy, available only to currently enrolled students	Free

*Transcripts are released by the Office of the Registrar only upon receipt of a written request that must include full name, signature of requestor, student number, dates of attendance, and reason for release of transcript.

Students are not charged additional course and laboratory fees with the exception of individualized instruction for music courses, specialized physical education courses, specific courses that require additional laboratory fees and transportation expenses for field trips/experiences. There may be additional expenses involved for the purchase of items such as slide rules, drafting sets, locks, goggles, etc., which are required for certain specialized and laboratory courses.

For information about the Information Technology fee, the Student Activity fee, and surcharges for specific colleges and programs, see **www.bursar.psu.edu/instructions.cfm#FEES**.

TERMS OF PAYMENT

Tuition and charges, including room and board, are due and payable in advance of each semester. Registration for courses will not be completed until a semester bill is filed.

Beginning approximately six weeks prior to the semester, bills are mailed to students who have enrolled in classes. Students who owe less than $100 will receive an e-mail notification in lieu of a paper Semester Bill/Registration Confirmation.

The Semester Bill/Registration Confirmation is available online at **www.bursar.psu.edu**. Bill recipients can view the Semester Bill, confirm registration, or pay by credit card online. There is a 2 percent Convenience Fee for each payment processed with a credit card. MasterCard and Discover credit cards are both accepted for tuition payments. The Bursar's office cannot accept credit cards via mail, phone, or in person. Semester bill payments may also be made by check, cash, or money order. All checks and money orders must be made payable to Penn State. Remit payment to Penn State University, Office of the Bursar, 103 Shields Building, University Park PA 16802.

Any student who does not fulfill payment of obligations by the deadline established may be charged the late payment fee of $25. If checks tendered for payment of tuition and charges are not paid upon presentation to the maker's bank, the student will automatically incur the returned item fee of $25.

The University reserves the right to withhold transcripts and services to any current or former student who has an unsatisfied financial obligation to the University.

For more information on the Semester Bill/Registration Confirmation, refer to **www.bursar.psu.edu/instructions.cfm.**

TUITION ADJUSTMENT POLICY

TUITION PENALTY FOR DROPPED CREDITS

Beginning with the first day of classes, students who drop below full-time or drop below their originally registered credit level may be assessed a tuition penalty. Adjustments for tuition will be determined on the effective date of the drop. Any adjustment of charges will be made according to Penn State's Tuition Adjustment Schedule (below). For the most current schedule, see **www.bursar.psu.edu/adjustments.cfm.**

TUITION ADJUSTMENT SCHEDULE

Duration of Course: Tuition-Adjustment Percentage

1 week or less: 0

2–3 weeks: 1st week 50%; 2nd week 0

4–5 weeks: 1st week 70; 2nd week 40%; 3rd week 0

6 weeks: 1st week 70%; 2nd week 40%; 3rd week 20%; 4th week 0

7–10 weeks: 1st week 80%; 2nd week 60%; 3rd week 40%; 4th week 20%; 5th week 0

11 weeks or more: 80% 1st week and a decrease of 10% for each week thereafter up to and including the eighth consecutive calendar week

NOTE: Adjustment is based on the tuition amount only. Information technology fee and activities fees are nonrefundable. For the most current schedule, see **www.bursar.psu.edu/adjustments.cfm.**

WITHDRAWAL

Charges for tuition and room and board are adjusted upon withdrawal from the University only in the event the student obtains an Official Withdrawal Form at the office of the dean of his or her college or other degree-granting unit and presents it at the Office of the Registrar. Adjustment of tuition is based upon the date of last class attended provided an Official Withdrawal Form is received by the University Registrar within one calendar month of that date, otherwise the adjustment will be based on the date the Official Withdrawal Form is filed with the University Registrar. The withdrawal action can also be completed through eLion. Students who meet this condition are entitled to receive an adjustment of charges for tuition for the semester in accordance with Penn State's Tuition Adjustment Schedule. See **www.bursar.psu.edu/adjustments.cfm** for the most current schedule.

Adjustments of room an board are based upon the date belongings are removed and the room key is returned, or the effective date of the withdrawal from classes, whichever is later.

WITHDRAWAL FROM PENN STATE AND STUDENT FINANCIAL AID

—Students receiving student financial aid are expected to complete all credits started. Students not successfully completing all credits may lose their right to some or all of these funds during the semester and/or in future semesters.

—Students planning on withdrawing during the semester must follow the procedures established by the University. See above.

—Tuition reimbursement will follow Penn State's Tuition Adjustment Schedule. See **www.bursar.psu.edu/adjustments.cfm** for the most current schedule.

RETURN OF FEDERAL STUDENT AID

—To remain eligible for federal student aid during the semester, the student must be attending classes, taking exams and completing required course work.

—The 1998 Reauthorization of the Higher Education Act requires the University to calculate a Return of Federal Student Aid Funds for students who withdraw (officially or unofficially) from all classes on or before the 60 percent attendance point in the semester.

—Using a pro-rata schedule, the percentage of the semester attended is used to calculate the amount of the

student's earned versus unearned federal student aid funds. The number of calendar days spent attending classes is divided by the number of calendar days in the semester to determine the percentage of the semester attended.
—The unearned portion of federal student aid funds will be returned to the appropriate aid program(s). The funds are returned in the following order:

1. Federal Unsubsidized Stafford Loan
2. Federal Subsidized Stafford Loan
3. Federal Perkins Loan
4. Federal PLUS Loan
5. Federal Pell Grant
6. Federal SEOG Grant

Students withdrawing from classes are responsible for payment of any balance due after the required return of federal student aid funds.

Students who stop attending all classes without officially withdrawing will be subject to return federal student aid funds at the end of the semester based on withdrawal date/last documented date of attendance as determined by Penn State.

RETURN OF STATE GRANT FUNDS

After satisfying the return of all required federal student aid funds, any balance remaining in the student account from tuition, room and board, and fee adjustments will be returned to PHEAA based on the following PHEAA refund calculation:

Tuition Adjustment X PHEAA Grant = PHEAA Refund
Full-Time Tuition

The PHEAA grant refund will never exceed the amount of the PHEAA grant.
The student account will not be debited to satisfy the PHEAA Grant refund.

RETURN OF INSTITUTIONAL AND OTHER AID FUNDS

After satisfying the PHEAA grant refund, any balance remaining in the student account from all tuition, room and board, and fee adjustments will be returned to all other aid sources based on the following "other aid" refund calculation:

Other Aid Disbursed X Adjustment = Refund to other aid source
Total Aid Disbursed

The other aid refund will be distributed to the appropriate aid sources as follows:

1. Short-term loan (Not considered in aid calculation)
2. University loans
3. University scholarships
4. Other grants
5. Outside scholarships

Other aid sources should be adjusted up to the amount of each aid source.
The student account will not be debited to satisfy the "other aid" refund.

CREDIT BALANCES AFTER REQUIRED AID FUNDS HAVE BEEN RETURNED

If a credit balance remains in the student's account after the return of the required Federal Student Aid Funds, State Grant Funds, and Institutional and Other Aid Funds, the balance will be distributed according to the following priority:

1. Student, up to the amount the student paid for the semester
2. Student loans
3. Student grants and scholarships

POLICY FOR RETROACTIVE WITHDRAWALS

Refer to the following Web site for questions regarding the petition process for retroactive withdrawals: **www.psu.edu/dus/handbook** Students granted a retroactive withdrawal for a previous semester by the University Faculty Senate are not eligible for Penn State's Tuition Adjustment Policy referenced above.

REFUND POLICY

WITHDRAWAL/DROP REFUNDS—The Semester Bill payment will be refunded in full if you do not register and do not incur charges in University residence halls. If registration has been completed and you subsequently withdraw or drop to part-time, the refund will be made according to Penn State's Tuition Adjustment Schedule. Beginning with the first day of classes, students who drop below full-time or drop below their originally registered credit level may be assessed a tuition penalty. Adjustments for tuition will be determined on the effective date of the drop. Any adjustment of charges will be made according to Penn State's Tuition Adjustment Schedule. See **www.bursar.psu.edu/adjustments.cfm** for the most current schedule.

REFUND OF EXCESS FINANCIAL AID—Penn State will refund the credit balance in a student's account, which is the result of federal financial aid, within TWO weeks of either the aid being credited to the student's account or the first day of the semester, whichever is later. For the quickest delivery of this refund, students should sign up for Rapid Refund by using eLion at **http://eLion.psu.edu**. Select "Students" then enter the User ID and Access Account password. Next, from the menu on the left side of the screen, select "Refund Information." Student refunds can be electronically deposited into a bank account by clicking on the "Sign up for Rapid Refund" button. Students can also choose to have their refund mailed to a home or local address. Refunds that are delivered via mail will be delayed. For those students that do not indicate a refund preference, refunds will be mailed to the home address at a later time.

PLUS BORROWERS—If the parent borrower is due a refund of a PLUS Loan that exceeds the student's University charges, the refund may be directly deposited into the parent's bank account. Parents should enter the bank account information on the ACH Authorization Agreement. The ACH Authorization Agreement can be obtained by selecting the FORMS category in the left menu at **www. bursar.psu.edu**. If the refund should be deposited into the son or daughter's bank account, please enter his or her bank account information on the ACH Authorization Agreement. The completed form should be mailed to the Office of the Bursar, 103 Shields Building, University Park PA 16802.

INSURANCE PROTECTION

Any student who wants insurance protection while in attendance at the University (1) against personal injury or liability and/or (2) against loss of property by fire or theft must arrange personally for whatever insurance is desired.

STUDENT HEALTH INSURANCE PLAN—Penn State has negotiated an accident and sickness insurance policy with a variety of benefits available to all students at Penn State. This plan is administered through University Health Services with offices in 320 Grange Building at the University Park campus.

International students and their dependents (spouses and/or children) are required to have health insurance that meets certain criteria established by the University Student Insurance Committee. International students (and their dependents) must show proof of insurance at the Student Insurance Office on a yearly basis.

For further information about health insurance, please contact the Student Insurance Office at 814-865-7467.

STUDENT FINANCIAL AID

In addition to the student financial aid information provided below, students may want to consult the information on the Office of Student Aid Web site, **www.psu.edu/studentaid**. Additional questions should be directed to the Office of Student Aid, at **www.psu.edu/studentaid/contact.html**, 314 Shields Building on the University Park campus, or to the student financial aid representative at other Penn State campus locations.

STUDENT FINANCIAL AID PROGRAMS AVAILABLE TO UNDERGRADUATE DEGREE CANDIDATES

GRANTS (aid programs not requiring repayment)

Federal Pell Grant—The Federal Pell Grant is the major federal grant program available to eligible undergraduate students who demonstrate financial need. This award is available to undergraduates pursuing their first baccalaureate or associate degree.

Pennsylvania Higher Education Assistance Agency (PHEAA) Grant—A grant offered by the Commonwealth of Pennsylvania to assist undergraduates who have a financial need as defined by PHEAA guidelines. Applicants must be residents of Pennsylvania and enrolled at least half-time in a degree program.

NOTE: Non-Pennsylvania residents should contact their state higher education assistance agencies for information on state grants available for attending Penn State. Names and addresses of higher education assistance agencies are available online at **www.psu.edu/dept/studentaid/aidprog/stategrants.html**.

Federal Supplemental Educational Opportunity Grant (SEOG)—This grant is available to undergraduates with high financial need. It is typically awarded in combination with the Federal Work-Study Program and/or the Federal Perkins Loan. Priority is given to students eligible for the Federal Pell Grant.

Penn State Tuition Assistance Grant (PSTAG)—This grant is awarded to students demonstrating academic excellence and high financial need.

LOANS

Federal Perkins Loan—Provides loans to students who demonstrate financial need. The career maximum borrowing limit for undergraduate students is $15,000. The interest rate on this loan is 6 percent, and repayment begins nine months after a student ceases enrollment. Postponement of repayment or cancellation of the loan may be arranged under certain conditions following graduation.

Federal Subsidized Stafford Loan—This subsidized federal loan program offers students (attending on at least a half-time basis) the opportunity to borrow money for their education; the interest is paid for by the federal government while the student is in school. Repayment begins six months after a student ceases enrollment. First-year undergraduate students can borrow up to $2,625; second-year, $3,500; third- , fourth- , and fifth-year, $5,500. The maximum borrowing limit is $23,000 for undergraduate studies.

Federal Unsubsidized Stafford Loan—This loan is available to students who demonstrate limited or no eligibility for the Federal Subsidized Stafford Loan and requires a payment of the accruing interest while the student is enrolled. Terms and conditions for this loan, including borrowing limits, are consistent with those of the Federal Subsidized Stafford Loan program.

Federal PLUS Loan—Parent Loan for Undergraduate Students (PLUS) is an educational loan available to parents of dependent students. Similar to Federal Stafford Loans, this loan is federally sponsored. Repayment of the loan begins immediately. Parent may borrow up to the student's cost of attendence (minus other aid).

University Loans—University loans are funds established to help students with financial need. Funds are available, in limited amounts, to needy students. Repayment of this 6-percent-interest loan begins six months after the student ceases enrollment.

EMPLOYMENT

Federal Work-Study Program (FWSP)—The Federal Work-Study Program is a form of student financial aid that allows students to earn a portion of their documented financial need through an approved work-study position. This is a non-repayable source of aid since the student is paid an hourly wage for his or her employment.

Student Employment—Students who are interested in wage payroll employment on campus or in their local areas should contact their campus location Employment Office. University Park students can access the online contact information for wage payroll positions at **www.psu.edu/studentaid/aidprog/wage.html**.

SCHOLARSHIPS

University Scholarships—University Scholarships are awarded on the basis of superior high school or college academic performance and, in many cases, documented financial need. They are awarded either by the scholarship committees in the various Penn State academic colleges, by the Freshman or Faculty Senate Scholarship Committee, or by Commonwealth Campus Scholarship Committees.

ROTC Scholarships—ROTC offers scholarships to students in a variety of majors. See ROTC section for details.

HOW MUCH DOES IT COST TO ATTEND PENN STATE?

Penn State makes every effort to contain costs and has been recognized nationally for its cost efficiency. However, you can anticipate that costs will increase on an annual basis. To assist you with the planning for a Penn State education, projected below are the ESTIMATED costs for the 2004–05 academic year. Please use these cost estimates for planning purposes only. They are based on the budget Penn State anticipates submitting to the Commonwealth of Pennsylvania for 2004–05. Final tuition and fees are determined by the Board of Trustees every July, following approval of the University's state appropriation by the Commonwealth.

ESTIMATED 2004–05 PENN STATE COSTS

Pennsylvania Resident Tuition and Fees
Penn State University Park: $10,743
Penn State Erie: $9,921
Penn State Harrisburg: $9,901
Penn State Altoona and Penn State Berks: $9,921
Penn State: Abington, Beaver, Delaware County, DuBois, Fayette, Hazelton, Lehigh Valley, McKeesport, Mont Alto, New Kensington, Schuylkill, Shenango, Wilkes-Barre, Worthington Scranton, York: $9,621

Non-Pennsylvania Resident Tuition and Fees
Penn State University Park: $20,597
Penn State Erie: $16,046
Penn State Harrisburg: $16,026
Penn State Altoona and Penn State Berks: $14,963
Penn State: Abington, Beaver, Delaware County, DuBois, Fayette, Hazelton, Lehigh Valley, McKeesport, Mont Alto, New Kensington, Schuylkill, Shenango, Wilkes-Barre, Worthington Scranton, York: $14,467

Additional Costs Per Academic Year
ESTIMATED room and meal expenses: $6,200
ESTIMATED expenses for books and supplies: $1,100
ESTIMATED expenses for travel and personal supplies: $1,200 to $2,400

For an estimate of your 2004–05 student financial aid package, please access the Early Aid Estimate on eLion between October 15 and February 28 if you have been offered admission to the University.

HOW TO APPLY FOR STUDENT FINANCIAL AID

ALL students (graduate and undergraduate) must complete a Free Application for Federal Student Aid (FAFSA) on the Web at **www.fafsa.ed.gov** every year to be considered for student financial aid. The FAFSA serves as the single application for all types of student financial aid—federal, state, and Penn State programs. Non-Pennsylvania residents interested in a state grant should check with their home state grant agencies to determine if additional forms must be completed.

Students new to Penn State are encouraged to complete the FAFSA on the Web as soon after January 1 as possible, but no later than February 15 for maximum consideration of all available aid programs. All returning students are encouraged to complete the FAFSA on the Web no later than April 15 for maximum consideration of all student aid programs. Penn State typically begins new student awarding in mid-March; returning student awarding commences in mid-to late June.

All students are automatically considered for all University-wide scholarship opportunities; there is no scholarship application to complete for University-wide scholarships. However, some academic colleges ask continuing and transfer students to complete a college-specific scholarship application for consideration of scholarships awarded by the academic college. Students should check with their college to determine if a separate scholarship application is required.

All students are urged to explore, on their own, scholarship/grant opportunities offered by private scholarship organizations. For more information on private scholarships, see: **www.psu.edu/dept/studentaid/scholarships/priv_schresources.html**.

SELECTIVE SERVICE REGISTRATION COMPLIANCE—To receive federal student financial aid, all males are required to be registered with the Selective Service System. Disbursement of federal student aid funds cannot occur until registration is confirmed by the Selective Service System as a part of the processing of the FAFSA. This requirement applies to Federal Perkins Loan, Federal Supplemental Educational Opportunity Grant, Federal Work-Study Program, Federal Pell Grant, Federal Stafford Loan, and Federal Parent Loan for Undergraduate Students.

STUDENT FINANCIAL AID POLICIES

The Office of Student Aid at Penn State administers and coordinates the student financial aid programs according to applicable federal and state regulations and University policies that guarantee each student equal access to financial assistance. The Office of Student Aid employs the standard need analysis services of a licensed agent of the Department of Education to assess the financial aid eligibility of student applicants, ensuring equity of treatment among all applicants.

Eligibility for aid is contingent upon the student's financial need for assistance to meet educational costs. Each program has specific eligibility requirements that must be met before funds are awarded. In addition to financial need as a criterion for receiving aid, a student must be enrolled as a degree or provisional student. Nondegree students are not eligible to receive aid at Penn State. The University may require an official copy of the federal income tax return to verify eligibility for aid.

The Office of Student Aid assumes that all student financial aid applicants will keep apprised of all recommended completion dates for the Free Application for Federal Student Aid (FAFSA), the only student aid application required at Penn State. Because many student aid funds are limited, FAFSA records completed after the applicable recommended completion date are considered only as funds are available. On-time applicants receive first consideration. Current and prospective aid recipients are strongly encouraged to keep well informed of student financial aid application procedures by accessing their Penn State e-mail accounts, the Office of Student Aid Web site (**www.psu.edu/studentaid**), aid publications, news media, and agencies providing aid information.

Student financial aid is never automatically awarded for subsequent years. Students must reapply each year for aid by completing the Free Application for Federal Student Aid (FAFSA) on the Web at **www.fafsa.ed.gov**. Students who plan to attend the summer session should access the summer aid information at **www.psu.edu/studentaid/apply/summer.html**. The student aid award can be composed of federal, state, and University funds, and any other source of funds available to the student. While federal, state, and institutional student financial aid programs exist primarily to help students with the greatest financial need, the preponderance of educational costs for most students rests with the family.

It is the responsibility of the Office of Student Aid to assure the federal government that federal aid recipients will not be permitted to retain financial aid exceeding their financial need. Students should be aware that if the aid received is in excess of financial need, they will be notified of their responsibility to return the excess amount to the University.

FEDERAL STUDENT ASSISTANCE SATISFACTORY ACADEMIC PROGRESS STANDARD

Satisfactory academic progress must be maintained for continued consideration for federal financial assistance at Penn State. Students must comply with the following to ensure continued consideration:

1. Academic progress is determined during an annual review each spring. The review determines student financial aid eligibility for the next enrollment period (summer session and/or the following academic year).
2. Undergraduate students registering full-time must complete a minimum of 24 credits (based on full-time enrollment) in their first year to maintain satisfactory academic progress. Upperclass students can maintain satisfactory academic progress by continuing to successfully complete the minimum credits required.
3. The minimum credit requirement is determined in proportion to the number of credits registered while the student is enrolled in a degree or certificate program. For example, three-quarter-time students will be required to progress at 3/4 the minimum standard.
4. Students who drop credits, withdraw from a semester, unsuccessfully complete credits, enroll in audit or repeat courses, etc., may fall below the minimum requirement for satisfactory progress.
5. A one-time probation period is granted to undergraduate students who fall below the minimum credit requirement, but within the probation standard. Students on probation remain eligible for aid. The probation period lasts one academic year, after which the minimum credit requirement must be satisfied for future student financial aid eligibility.
6. Undergraduate students who are more than 12 credits deficient of the minimum credit requirements are determined to be making unsatisfactory progress and are not eligible for student financial aid.
7. Students falling to unsatisfactory progress, but returning to satisfactory progress through completion of summer session or fall semester credits, may be considered for student financial aid during the remainder of the academic year, on a funds-available basis.
8. Students in unsatisfactory progress status may regain eligibility by successfully completing a minimum of 12 credits at a 2.00 grade-point average or higher without failing, dropping, canceling or withdrawing credits, or withdrawing from semester(s).
9. Requirements for the baccalaureate degree must be completed within ten semesters.
10. Situations that fall outside the general policies as published are subject to the professional judgment made by the Chief Student Aid Administrator regarding continued eligibility.

Exceptions to the above and information concerning reinstatement of aid can be obtained by contacting the Office of Student Aid, The Pennsylvania State University, 314 Shields Building, University Park PA 16802-1220. The Federal Student Assistance Satisfactory Academic Progress Standard is available online at **www.psu.edu/studentaid/html/sap.html**.

GENERAL ACADEMIC INFORMATION

THE ACADEMIC YEAR

Penn State's academic year follows an early semester calendar consisting of fall and spring semesters. Under the early semester plan, all fall semester activities, including examinations, are concluded prior to the midwinter holiday recess in December.

The academic year consists of 145 class days and ten assessment/examination days. Registration, advising, and orientation periods prior to each semester vary in length, according to the requirements for the semester. Dates are shown in the academic calendar on the Registrar's Web site:
www.psu.edu/dept/registrar/calendar/calendar_index.html.

Typical class periods are fifty minutes long. The average student enrolls in 12 to 19 credits per semester.

SUMMER SESSIONS—In addition to the two semesters, two six-week summer sessions are offered each summer. Some classes are offered for different enrollment periods during these twelve weeks. The Summer Sessions offer a wide range of courses at all levels. The Summer Schedule of Courses is published by the Registrar's office; the most current information is found by accessing the Registrar's home page at: **www.psu.edu/registrar**. Information regarding additional summer session activities can be found at **www.psu.edu/summersession**.

REGISTRATION

Dates for advising, registration, and classes are given in the University calendar at the front of this bulletin. Registration information for Continuing Education courses is available from the Continuing Education office at each campus or service area. Students with an active University Access Account register through eLion at **elion.psu.edu**.

In order to enroll in courses, a student must complete the registration process during the assigned time. No student may register for another student. A student's registration is not complete unless a semester bill has been accepted by the Bursar. Tuition charges for all scheduled classes will be assessed accordingly.

GRADING SYSTEM

CREDITS—Credits are awarded on the semester-hour basis. The distribution of time between class activities and outside preparation varies from course to course; for the average student, however, at least forty hours of work per semester planned and arranged by the University faculty are required to gain 1 credit.

GRADING SYSTEM—The grades of A, B, C, D, and F indicate the following qualities of academic performance:

A	(EXCELLENT) Indicates exceptional achievement.
B	(GOOD) Indicates extensive achievement.
C	(SATISFACTORY) Indicates acceptable achievement.
D	(POOR) Indicates only minimal achievement. It indicates that the student may be seriously handicapped in carrying a more advanced course for which this course is a specific prerequisite.
F	(FAILURE) Indicates inadequate achievement necessitating a repetition of the course to secure credit.

The grades of A, A-, B+, B, B-, C+, C, D, and F indicate a gradation in quality from Excellent to Failure and are assigned the following grade-point equivalents:

Grade	*Grade-Point Equivalent*
A	4.00
A-	3.67
B+	3.33
B	3.00
B-	2.67
C+	2.33
C	2.00
D	1.00
F	0

Grade points are determined by multiplying the grade-point equivalent of the grade earned by the number of credits for the subject, e.g., ENGL 015 GWS, 3 credits, with a grade of A (grade-point equivalent 4.00) yields 12 grade points.

POLICIES AND RULES

It is the responsibility of students to be familiar with the rules, regulations, and procedures of the University. *Policies and Rules* includes information on academic procedures, code of conduct, general University policies, privacy rights of students, and responsibilities for community living. *Policies and Rules* is available on the Web at **www.sa.psu.edu/ja/pdf/disc_procedures.pdf**. Academic policies and rules are at: **www.psu.edu/ufs/policies.**

REQUIREMENTS FOR GRADUATION

To graduate, a candidate must complete the course requirements for the candidate's major and:

1. earn at least a C (2.00) cumulative grade-point average for all courses taken at the University;
2. earn at least a C grade in each major course designated by the major as a C-required course.

RESIDENCE REQUIRED FOR DEGREE

Every candidate for a degree shall earn as a degree candidate at least 36 of the last 60 credits for a baccalaureate degree and at least 18 of the last 30 credits for an associate degree in courses offered by the University or in cooperative degree programs established by formal agreement and approved by the University Faculty Senate.

A candidate for a first baccalaureate degree shall earn the last 60 credits required for that degree within five calendar years. An extension of time shall be granted for intervening military service.

A course schedule, including courses offered by resident education or Continuing Education, is made by each student.

A typical credit load for a full-time student is defined to be from 12 to 19 credits per semester. Students are not permitted to advance register or register in the normal registration period for more than 19 credits. Students are permitted to add courses beyond this maximum 19 credits after consultation with the adviser during the first ten calendar days of the semester.

PLANNING A DEGREE PROGRAM

Primary responsibility for the successful completion of a degree program lies with the student. The key to meeting this responsibility is personal involvement in academic program planning. To plan a program of study that will best meet individual goals and interests, students must know the requirements and restrictions of the department, college or other degree-granting unit, and the University; know the sources of academic information; work closely with an adviser in examining programs and course requirements and alternatives; and consult the *Undergraduate Degree Programs Bulletin* **(www.psu.edu/bulletins/bluebook).**

The University comprises a family of campuses located throughout the Commonwealth (see **www.psu.edu/ur/cmpcoll.htm**). For most degree programs, a student may begin his or her studies at any one of the campuses. More than 160 baccalaureate majors, more than 25 associate degree majors, and more than 7,000 undergraduate courses are offered by the University. Clearly, each campus cannot offer every academic program or every course. As a result, admission to several academic programs is restricted, and students selecting these programs may be required to begin their studies at a specified campus. In other cases, admission to certain academic programs must be approved when a first-year student enters the University; transfer into these programs at a later point in a student's career is not possible. For these reasons, it is imperative that a student understand both program and course limitations at the campus of enrollment.

The many programs at Penn State allow varying degrees of flexibility. An early decision to pursue a highly structured program enables the student to complete the program in the optimum length of time by taking the required courses in a sequence that allows the smoothest progression from one level to the next. Even the most regulated programs, however, allow choices within given boundaries. Other programs allow a considerable range of choices in the completion of the requirements. Students should be aware of possible difficulties in transferring from a flexible program to a more highly structured program. Whether a program is highly structured or quite flexible, it is extremely important that the student understand program requirements when enrolling in the University.

Information concerning the University, its academic programs, course offerings, campuses, and academic organization is available from the following sources:

FIRST-YEAR TESTING, COUNSELING AND ADVISING PROGRAM (FTCAP)—First-year students entering Penn State are scheduled, through the Division of Undergraduate Studies, for a comprehensive testing and advising program that provides an overview of the academic opportunities and activities available to students. The First-Year Testing, Counseling and Advising (**www.psu.edu/dus/ftcap.htm**) program also provides individual educational planning interviews in which students may discuss their abilities and interests in terms of Penn State programs.

INFORMATION FOR NEW STUDENTS—The Office for Communication provides first-year students as well as advanced standing and change-of-assignment students at the University Park campus with comprehensive information regarding the essential academic and student development opportunities of the campus and the University in general beginning with a new student's acceptance to a campus and continuing through completion of his/her first semester.

Through programs offered in cooperation with the colleges' academic units and various student service operations, new students are introduced to the intellectual and scholarly expectations of the University, to the skills needed for advanced study and lifelong learning, and to the student development opportunities with academic merit. In addition, this office helps inform students of the required procedures for matriculation and offers a perspective on college life, including practical information about important dates, times, and locations (e.g., arrival day, first day of classes, course drop/add).

During arrival week each semester, new students receive instruction and counseling about their courses of study, including help with registration and class schedule adjustments, and they participate in special activities.

ACADEMIC ADVISERS—Each student is assigned a primary academic adviser in his or her college, school, or the Division of Undergraduate Studies. Students can find their adviser's name and contacts information using the Adviser Information application on eLion (**www.eLion. psu.edu**). The adviser is available to help a student plan an academic program, schedule each semester's courses, and provide information about majors and refer a student to other appropriate sources of information. See **www.psu.edu/advising** for more information.

ACADEMIC ADVISING CENTERS—Academic advising centers are located in every college at University Park and at all other Penn State undergraduate locations. Centers provide advising and information about academic programs. Lists of University Park centers and centers at other locations are available online. University Park: **www.psu.edu/dus/handbook/upinfo.htm**; other locations: **www.psu.edu/dus/handbook/cesinfo2.html**.

PENN STATE'S HOME PAGE—**www.psu.edu**, provides information on the University and each of its colleges.

THE SCHEDULE OF COURSES—Course offering and registration information is available on the Web at **www.psu.edu/registrar**. The *Schedule of Courses* information is updated once each day and provides current information about the courses being offered at all Penn State campuses.

UNDERGRADUATE DEGREE PROGRAMS

DEFINITIONS

The following definitions, referring to degrees, majors, options, and minors, have been adopted by the University Faculty Senate Curricular Affairs Committee:

Associate Degree—Two-year majors that, with a few exceptions, provide concentrated instruction to prepare graduates for specialized occupational assignments.

Baccalaureate Degree—An award signifying a rank or level of educational attainment. Particular types of baccalaureate degrees identify educational programs having common objectives and requirements. Degree programs may provide academic, preprofessional, or professional experiences and preparation. Majors lead to a baccalaureate degree. Each student must select a major within a baccalaureate degree type. If options are offered within a major, a student selects one. The student may also elect to enroll in a minor to supplement the major. Alternatively, the student may seek to enroll in multiple majors within the same type of baccalaureate degree or to enroll in a simultaneous degree program. A baccalaureate program of study shall consist of no less than 120 credits. Students may elect to take courses beyond the minimum requirements of a degree program.

Major—A plan of study in a field of concentration within a type of baccalaureate degree. Colleges and other degree-granting units may have common requirements for all of their majors. Each major may have requirements identified in Prescribed, Additional, and Supporting categories of courses.

Option—A specialization within a major that should involve at least one-third of the course work credits required for the major, but need not be more than 18 credits. All options within a major must have in common at least one-fourth of the required course work credits in the major. A student can only be enrolled in an option within his/her own major.

Minor—A supplemental academic program of at least 18 credits. A minor program may consist of course work in a single area or from several disciplines, with at least 6 but ordinarily not more than half of the credits at the 400-course level. Total requirements are to be specified and generally limited to 18 to 21 credits. Entrance to some minors may require the completion of a number of prerequisite courses that are not included in the total requirements for the minor. Grade requirements shall consist of C or above for all courses required for the minor.

Concurrent Majors—A plan of study meeting the requirements of two or more majors that combine two or more distinct fields of study leading to the same baccalaureate degree.

Concurrent Degrees—A plan of study meeting the requirements of two majors that combine two distinct fields where an unusual combination of background and breadth is desired by the student.

BACHELOR OF ARTS—*Bachelor of Arts* degree majors require 12 to 24 credits distributed among five categories. In addition, students are expected to complete credits required by their college and major.

Foreign Language (0–12 credits)
Proficiency in a single foreign language must be demonstrated by either examination or course work equivalent to completion of 12 credits of course work.
Arts (3 credits)
Humanities (3 credits)
Social and Behavioral Sciences (3 credits)
Other Cultures (3 credits) (NOTE: Other Cultures courses may not be double counted with Intercultural and International Competence courses.)

These B.A. requirements are listed at the beginning of the descriptions of each college or school that offers the majority of the B.A. majors, or are listed under individual B.A. majors.

BACHELOR OF PHILOSOPHY—The *Bachelor of Philosophy* degree is the only one not offered through any college or school but rather on a University-wide basis. This degree allows students to plan their own programs, in conjunction with a faculty preceptor, within the framework of the academic program of the University. A description of this degree is found in the Intercollege Undergraduate Programs section of this bulletin.

GENERAL EDUCATION

For details on General Education, including writing and intercultural/international requirements, see **www.psu.edu/bulletins/bluebook/gened**.

ASSOCIATE DEGREES GRANTED

Majors that lead to two-year associate degrees are available at most of Penn State's locations, as listed previously in this bulletin. These majors provide concentrated instruction to prepare graduates for specialized occupational assignments, except for the Letters, Arts, and Sciences major, which provides graduates with a general education and some specialization in their fields of interest. In addition, a major in Dietetic Food Systems Management is available primarily through the Department of Independent Learning.

More than twenty associate degree majors lead to either the Associate in Arts degree, the Associate in Engineering Technology degree, or the Associate in Science degree.

TWO-YEAR ASSOCIATE DEGREE MAJORS

The following majors are offered. More details can be found in this bulletin; on the Web through **www.psu.edu** (the Penn State home page), or by calling individual colleges.

ASSOCIATE IN ARTS DEGREE
Criminal Justice; Letters, Arts, and Sciences; Sociology

ASSOCIATE IN ENGINEERING TECHNOLOGY DEGREE
Architectural Engineering Technology+;Biomedical Engineering Technology+; Electrical Engineering Technology+; Materials Engineering Technology; Mechanical Engineering Technology+; Nanofabrication Manfacturing Technology; Plastics Engineering Technology; Surveying Technology+; Telecommunications Technology+

ASSOCIATE IN SCIENCE DEGREE
Agricultural Business; Business Administration; Computer Science; Dietetic Food Systems Management**; Forest Technology; General Business; Hotel, Restaurant, and Institutional Management; Human Development and Family Studies; Information Sciences and Technology; Manufacturing Technology; Medical Laboratory Technology; Nursing; Occupational Therapy; Physical Therapist Assistant; Radiological Sciences; Science; Wildlife Technology

+Accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (TAC of ABET) at all locations offering the full two years of the program.
**Offered primarily through Department of Distance Education's Independent Learning program.

BACCALAUREATE DEGREES GRANTED

Undergraduate majors offered at Penn State lead to one or more of the following baccalaureate degrees: Bachelor of Arts, Bachelor of Science, Bachelor of Fine Arts, Bachelor of Architecture (five-year program), Bachelor of Architectural Engineering (five-year program), Bachelor of Music, Bachelor of Musical Arts, and Bachelor of Philosophy. Not all degrees are offered at every location. Baccalaureate degrees offered at Penn State include both those that are designed to provide an academic (including preprofessional) experience and those that are specifically designed to provide professional preparation. To ensure excellence, all professionally oriented degree majors provide a strong academic base. The Bachelor of Arts degree (with a given major) is an academic degree; the Bachelor of Science degree (with a given major) and the bachelor's degree in any subject area (e.g., Bachelor of Architecture) are professional degrees. The Bachelor of Philosophy degree, described under Intercollege Undergraduate Programs in this bulletin, is planned individually and may be designed to serve either academic or professional purposes. Detailed descriptions of each baccalaureate degree major follow the General Information section of this bulletin.

BACCALAUREATE DEGREE MAJORS

The following majors are offered. More details can be found in this bulletin and on the Web through **www.psu.edu** (the Penn State home page), or by calling individual colleges.

ABINGTON COLLEGE
Administration of Justice; American Studies; Business; Corporate Communication; English; History; Information Sciences and Technology; Integrative Arts; Letters, Arts, and Sciences; Psychological and Social Science; Science

COLLEGE OF AGRICULTURAL SCIENCES
Agribusiness Management; Agricultural and Biological Engineering; Agricultural and Extension Education; Agricultural Science; Agricultural Systems Management; Agroecology; Animal Bioscience; Animal Sciences; Environmental and Renewable Resource Economics; Environmental Resource Management; Environmental Soil Science; Food Science; Forest Science; Horticulture; Landscape Contracting; Turfgrass Science; Wildlife and Fisheries Science; Wood Products

ALTOONA COLLEGE
Biology; Business; Communications; Criminal Justice; Electro-Mechanical Engineering Technology; Elementary and Kindergarten Education; English; Environmental Studies; Human Development and Family Studies; Integrative Arts; Letters, Arts, and Sciences; Mathematics; Nursing; Psychology; Science

COLLEGE OF ARTS AND ARCHITECTURE
Architecture; Art; Art Education; Art History; Graphic Design; Integrative Arts; Landscape Architecture; Music; Music Education; Musical Arts; Theatre

BERKS-LEHIGH VALLEY COLLEGE
American Studies; Applied Psychology; Business; Electro-Mechanical Engineering Technology; Global Studies; Information Sciences and Technology; Interdisciplinary Liberal Arts; Kinesiology; Professional Writing; Science

SMEAL COLLEGE OF BUSINESS
Accounting; Actuarial Science; Agribusiness Management; Economics; Finance; Management; Management Information Systems; Marketing; Supply Chain and Information Systems

CAPITAL COLLEGE
Accounting; American Studies; Applied Behavioral Science; Business (General); Communications; Computer Science; Criminal Justice; Electrical Engineering; Electrical Engineering Technology; Elementary Education and Early Childhood Education; English; Environmental Engineering; Finance; Information Sciences and Technology; Information Systems; Interdisciplinary Humanities; Management; Marketing; Mathematical Science; Mechanical Engineering Technology; Nursing; Psychology; Public Policy; Secondary Education Social Studies; Sociology; Structural Design and Construction Engineering Technology

COMMONWEALTH COLLEGE
Administration of Justice; American Studies; Applied Psychology; Business; Communication Arts and Sciences; Communications; Electrical Engineering Technology; Electro-Mechanical Engineering Technology; English; Human Development and Family Studies; Information Sciences and Technology; Letters, Arts, and Sciences; Nursing; Occupational Therapy; Science; Surveying; Urban Early and Middle Childhood Education

COLLEGE OF COMMUNICATIONS
Advertising-Public Relations; Film and Video; Journalism; Media Studies; Telecommunications

COLLEGE OF EARTH AND MINERAL SCIENCES
Earth and Mineral Sciences and Liberal Arts Concurrent Degree; Earth Sciences; Energy, Business, and Finance; Environmental Systems Engineering; Geography; Geosciences; Industrial Health and Safety; Materials Science and Engineering; Meteorology; Mineral Economics; Mining Engineering; Petroleum and Natural Gas Engineering

COLLEGE OF EDUCATION
Elementary and Kindergarten Education; Rehabilitation Services; Secondary Education; Special Education; Workforce Education and Development

COLLEGE OF ENGINEERING
Aerospace Engineering; Agricultural and Biological Engineering; Architectural Engineering (ten semesters); Bioengineering; Chemical Engineering; Civil Engineering; Computer Engineering; Computer Science; Electrical Engineering; Electro-Mechanical Engineering Technology; Engineering and Liberal Arts Concurrent Degree; Engineering Science; Industrial Engineering; Mechanical Engineering; Nuclear Engineering; Surveying (only at Wilkes-Barre campus)

PENN STATE ERIE, THE BEHREND COLLEGE
Accounting; Biology; Business Economics; Business, Liberal Arts, and Science; Chemistry; Communication and Media Studies; Computer Engineering; Computer Science; Creative Writing; Economics; Electrical Engineering; Electrical Engineering Technology; English; Finance; General Arts and Sciences; History; International Business; Management; Management Information Systems; Marketing; Mathematics; Mechanical Engineering; Mechanical Engineering Technology; Physics; Plastics Engineering Technology; Political Science; Psychology; Science; Software Engineering

COLLEGE OF HEALTH AND HUMAN DEVELOPMENT
Biobehavioral Health; Communication Sciences and Disorders; Health Policy and Administration; Hotel, Restaurant, and Institutional Management; Human Development and Family Studies; Kinesiology; Nursing; Nutritional Sciences; Recreation and Park Management

SCHOOL OF INFORMATION SCIENCES AND TECHNOLOGY
Information Sciences and Technology

COLLEGE OF THE LIBERAL ARTS
African and African American Studies; American Studies; Anthropology; Archaeological Science; Biological Anthropology; Classics and Ancient Mediterranean Studies; Communication Arts and Sciences; Comparative Literature; Crime, Law, and Justice; East Asian Studies; Economics; English: French; Geography; German; History; International Politics; International Studies; Italian; Japanese; Jewish Studies; Labor and Industrial Relations; Latin American Studies; Letters, Arts, and Sciences; Liberal Arts and Earth and Mineral Sciences Concurrent Degree; Liberal Arts and Engineering Concurrent Degree; Medieval Studies; Organizational Leadership; Philosophy; Political Science; Psychology; Religious Studies; Russian; Russian Translation; Sociology; Spanish; Women's Studies

EBERLY COLLEGE OF SCIENCE
Astronomy and Astrophysics; Biochemistry and Molecular Biology; Biology; Biotechnology; Chemistry; Five-year Science/Business; Mathematics; Microbiology; Physics; Premedical-Medical; Premedicine; Science; Statistics

INTERCOLLEGE
Bachelor of Philosophy (University Park only)

WORLD CAMPUS
Letters, Arts, and Sciences

BACCALAUREATE DEGREE MINORS

The following minors are offered. Additional information can be found in subsequent sections of this bulletin.

ABINGTON COLLEGE
African American Studies; American Studies; Anthropology; Business; Business/Liberal Arts; Communication Arts and Sciences; English; History; International Studies; Philosophy; Psychology; Sociology

COLLEGE OF AGRICULTURAL SCIENCES
Agribusiness Management; Agricultural and Biological Engineering; Agricultural Communications; Agricultural Economics and Rural Sociology; Agricultural Mechanization Technology; Agronomy; Animal Sciences; Environ-

mental and Renewable Resource Economics; Environmental Resource Management; Environmental Soil Science; Equine Science; Extension Education; Forest Science; Horticulture; International Agriculture; Leadership Development; Mushroom Science and Technology; Off-Road Equipment; Plant Pathology; Wildlife and Fisheries Science; Wood Products Marketing; Youth and Family Education

ALTOONA COLLEGE
Communications; Criminal Justice; Dance Studies; English; Entrepreneurship; Environmental Studies; Health Policy; History; Human Development and Family Studies; Mathematics; Natural Science; Political Science; Psychology; Spanish; Women's Studies

COLLEGE OF ARTS AND ARCHITECTURE
Architectural History; Architecture Studies; Art History; Dance; Digital Arts, and Information Sciences and Technology; Music; Theatre

BERKS-LEHIGH VALLEY COLLEGE
Business; Communication Arts and Sciences; Natural Science; Professional Writing; Spanish

SMEAL COLLEGE OF BUSINESS
Business Logistics; Global Business Strategies for the Earth, Energy, and Mineral Industries; Insurance; International Business; Legal Environment of Business; Management Information Systems; Operations Management; Real Estate; Supply Chain and Information Sciences and Technology

CAPITAL COLLEGE
American Studies; Business Administration; Computer Science; Information Sciences and Technology for Accounting; International Business; Women's Studies; Writing

COMMONWEALTH COLLEGE
American Studies; Business; Business/Liberal Arts; Communication Arts and Sciences; English; International Studies; Law and Liberal Arts; Philosophy; Political Science; Psychology; Sociology; Technical Writing; Women's Studies

COLLEGE OF COMMUNICATIONS
Film Studies; Information Sciences and Technology for Telecommunications; Media Studies

COLLEGE OF EARTH AND MINERAL SCIENCES
Climatology; Earth Systems; Electronic and Photonic Materials; Energy, Environmental, and Mineral Economics; Geographic Information Science; Geography; Geosciences; Global Business Strategies for the Earth, Energy, and Material Industries; Industrial Health and Safety; Information Sciences and Technology for Earth and Mineral Sciences; Meteorology; Mining Engineering; Polymer Science; Watershed and Water Resources

COLLEGE OF EDUCATION
Education Policy Studies; Technology Integration for Pre-Service Teachers

COLLEGE OF ENGINEERING
Agricultural and Biological Engineering; Bioengineering; Chemical Engineering; Engineering Entrepreneurship; Engineering Leadership Development; Engineering Mechanics; Environmental Engineering; Peace and Conflict Studies; Product Realization; Science, Technology, and Society

PENN STATE ERIE, THE BEHREND COLLEGE
Accounting; Biology; Chemistry; Communication; Computer Engineering; Computer Science; Economics; English; Finance; History; International Studies; Management; Management Information Systems; Marketing; Mathematics; Physics; Political Science; Psychology; Statistics; Women's Studies

COLLEGE OF HEALTH AND HUMAN DEVELOPMENT
Deafness and Hearing Studies; Health Policy and Administration; Human Development and Family Studies; Information Sciences and Technology in Health Policy and Administration; Information Sciences and Technology for Hotel, Restaurant, and Institutional Management; Movement Science; Nutritional Sciences; Recreation and Park Management

SCHOOL OF INFORMATION SCIENCES AND TECHNOLOGY
Digital Arts and Information Sciences and Technology; Information Sciences and Technology; IST for Earth and Mineral Sciences; IST for Health Policy and Administration; IST for Hotel, Restaurant, and Institutional Management; IST for Mathematics; IST for Speech Communication; IST for Telecommunications; Supply Chain and IST

COLLEGE OF THE LIBERAL ARTS
African Studies; African American Studies; American Studies; Anthropology; Asian Area Studies; Black Diaspora Studies; Business/Liberal Arts; Chinese Language; Classics and Ancient Mediterranean Studies; Communication Arts and Sciences; Dispute Management and Resolution; Economics; English; Film Studies; French; German; Greek; Hebrew; History; Information Sciences and Technology for Speech Communication; Information Systems and Statistical Analysis; International Studies; Italian; Japanese Language; Jewish Studies; Labor and Industrial

Relations; Law and Liberal Arts; Latin; Latin American Studies; Linguistics; Middle East Studies; Pennsylvania Studies; Philosophy; Political Science; Psychology; Religious Studies; Russian; Russian Area Studies; Russian Translation; Sociology; Spanish; Technical Writing; Women's Studies; World Literature

EBERLY COLLEGE OF SCIENCE
Astronomy and Astrophysics; Biochemistry and Molecular Biology; Biology; Chemistry; Information Sciences and Technology for Mathematics; Mathematics; Microbiology; Natural Science; Physics; Statistics

INTERCOLLEGE
Astrobiology; Environmental Inquiry; Gerontology; Marine Sciences; Military Studies; Neuroscience

SPECIAL ACADEMIC PROGRAMS

ACADEMIC ADVANCEMENT PROGRAMS

Academic Advancement Programs (AAP) is administered by the vice provost for educational equity, (**www.equity.psu.edu and www.equity.psu.edu/aap**). AAP is composed of the following units:

COLLEGE ASSISTANCE MIGRANT PROGRAM (CAMP)—is a federally funded program designed to assist first-year college students from migrant and seasonal farm worker families. Nationally established in 1972, CAMP has been available at Penn State since 1993. CAMP offers precollege transition and first-year support services to help students develop the skills they need to stay in college and graduate. In addition, the program delivers support services to satisfy the educational and personal needs of each participant. While enrolled as full-time students, all CAMP participants receive assistance including: academic and personal counseling; tuition grant to supplement aid from state or federal source; weekly stipend; limited travel reimbursement; assistance in purchasing books; educational and cultural programs; peer, faculty, and staff support in adjusting to University life; and orientation to University support services. Information about the program is available at 204 Boucke Building, University Park, PA 16802-5900; telephone 814-863-9440 or **www.equity.psu.edu/aap/camp**.

COMPREHENSIVE STUDIES PROGRAM (CSP)—is supported by Act 101 of the State of Pennsylvania and is designed to develop the basic academic skills and competence of students who attend the University Park campus through the Educational Opportunity Program. CSP provides developmental course work in English, mathematics, reading, and listening/study skills. In addition to formal instruction, students in CSP receive special tutorial support, academic monitoring, and intensive individual counseling. Information about the program is available at 207B Boucke Building, University Park, PA 16802-5900; telephone 814-863-4374 or **www.equity.psu.edu/aap/csp**.

EDUCATIONAL OPPORTUNITY CENTERS (EOC)—are funded by a grant from the United States Department of Education within a family of programs called TRIO. EOCs assist low-income adults, age 19 or older, whose parents did not graduate from college, to begin or continue a program of postsecondary education. Services are free and include help in completing admission and financial aid applications, making decisions about careers, enrolling in GED programs, as well as other services related to pursuing higher education. Penn State operates two EOC programs, one in Philadelphia and one in southwestern Pennsylvania. Information about the Philadelphia EOC is available at **www.equity.psu.edu/aap/eoc/phila**; telephone 215-246-3506. The southwestern Pennsylvania EOC is based at three locations: Penn State McKeesport, Penn State Fayette, and Penn State Beaver. Information about EOC-SWPA is available at **www.equity.psu.edu/aap/eoc/swpa**; 1-888-362-7972.

THE EDUCATIONAL OPPORTUNITY PROGRAM (EOP)—is a special admission program that addresses the commitment of the University to provide equal access to higher education throughout the Commonwealth of Pennsylvania for residents who are recent high school graduates with academic promise, but who are both educationally and financially disadvantaged. EOP has been in existence since 1969 and has provided access to Penn State at all locations for approximately 7,000 students to date.

EOP candidates apply for admission to Penn State in the usual manner and must meet the high school graduation requirement (high school diploma or its equivalent) for admission. Students who meet EOP academic and financial guidelines are granted a personal interview. Based on results of the interview, a student may be offered admission at University Park campus through the Comprehensive Studies Program (CSP) or admission at another Penn State location. Once accepted, EOP students are admitted as resident degree students and are offered counseling, study skills programs, and tutoring and learning support with emphasis on highly individualized support.

While the Undergraduate Admissions office is primarily responsible for the recruitment and admission of EOP students, all the support services offered by the program at University Park campus are administered through the vice provost for Educational Equity. Most programs at other Penn State locations have EOP coordinators who operate their support services and maintain a close liaison with University Park campus. Telephone 814-865-8399 or 863-4374 for information about all programs.

PROJECT UPWARD BOUND—helps high school students gain the skills and motivation necessary to succeed in postsecondary education. The program admits students from low-income families in which neither parent graduated from college. The students are selected on their potential to succeed in postsecondary education, but must show a need for academic support at the time of their admission to the program. Services include tutoring, academic and career counseling, cultural trips, college tours, motivational workshops, career exploration, SAT preparation, and assistance with completing college and financial aid applications. Participants also have the opportunity to attend the Upward Bound summer program—a residential six-week academic session at University Park. Information about the program is available at 203 Grange Building, University Park, PA 16801-4756; telephone 814-865-2320 or **www.equity.psu.edu/aap/ub**.

PENN STATE TRIO TRAINING INSTITUTE—is a federally funded training program for personnel who work in TRIO programs across the nation. Training for 2003–04 focuses on helping staff from Student Support Services and Ronald E. McNair Scholars programs to improve program management, better retain students, and prepare students for graduate school. The faculty includes nationally known TRIO administrators chosen for their expertise and facilitation skills. Training is offered at least four times each year in major cities. The Web address for registering is www.equity.psu.edu/aap/trio. Information is available at 402 Grange Building, University Park, PA 16802-5903; telephone 814-863-8389.

RONALD E. McNAIR POST-BACCALAUREATE ACHIEVEMENT PROGRAM—provides preparation and assistance to low-income, first-generation undergraduate students, and undergraduate students from groups underrepresented in graduate education, for doctoral study. Services available to students participating in the Ronald E. McNair Scholars program include research opportunities, seminars designed to prepare students for doctoral study, tutoring, academic counseling, and assistance in securing admission to graduate programs. Information about this program is available at 100 Spruce Cottage, University Park, PA 16802-4606; telephone 814-863-1095 or **www.equity.psu.edu/aap/ms**.

STUDENT SUPPORT SERVICES PROGRAM (SSSP)—is a program that helps to increase college retention and graduation rates of eligible, low-income, first-generation college students and students with learning and/or physical disabilities enrolled at University Park. SSSP works in collaboration with all academic units, student service programs, and student organizations at Penn State. The program provides academic support and personal, career, and financial counseling as well as out-of-class learning opportunities to help students reach their educational goals. Information about this program is available at 205 Boucke Building, University Park, PA 16802-5900; telephone 814-863-9442 or **www.equity.psu.edu/aap/sss**.

TALENT SEARCH PROGRAMS—are funded by a grant from the United States Department of Education within a family of programs called TRIO. The Talent Search programs identify and assist individuals from low-income and first-generation backgrounds who have the potential to succeed in higher education. The goal of Talent Search is to increase the number of students who complete high school and enroll in the postsecondary educational institution of their choice. The programs provide sixth- through twelfth-grade students with academic advising, career counseling, motivational workshops, college fairs, visits to colleges, and assistance in completing admission and financial aid applications. The Talent Search programs also work with high school and college dropouts by encouraging them to reeenter the educational system to complete their education. Penn State operates two Talent Search programs: One is the Talent Search Program for Western Pennsylvania, which serves the Aliquippa, Clairton, Farrell, New Kensington-Arnold, and Sharon school districts. For more information, telephone 814-863-7359, visit **www.equity.psu.edu/aap/ts**, or stop by 100 Spruce Cottage, University Park, PA 16802-4604. The second program is the Educational Talent Search Program, York City School District; telephone 717-845-7512.

UPWARD BOUND MATH AND SCIENCE CENTER (UBMS)—promotes educational opportunity for Pennsylvania high school students grades 9 through 12 who are from low-income backgrounds or who will be the first in their families to acquire a bachelor's degree. The goal of the program is to help students recognize and develop their potential to excel in math and science and to encourage them to pursue postsecondary degrees in these fields. UBMS provides a six-week intensive experience at the University Park campus each summer that includes math/science-related course work and research, computer skill development, educational field trips, career development activities, and interaction with math/science professionals. Educational planning, career counseling, mentoring, and assistance with the postsecondary admissions process are some of the additional services provided throughout the school year. The project serves sixty students annually. Contact 401 Boucke Building, University Park, PA 16802-5903 for more information; telephone 814-863-1296 or **www.equity.psu.edu/aap/ubms**.

ENVIRONMENTAL EMPHASIS PROGRAMS

The University offers a wide range of opportunities in undergraduate programs with environmental emphasis. Programs with an emphasis on the natural world include:

Agriculture (various fields)	Environmental Systems Engineering
Biology (various fields)	Geography
Earth Sciences	Geosciences
Environmental Engineering	Meteorology

Programs stressing human use of and impact on the natural world are offered individually or jointly by various colleges. Descriptions of individual programs and related courses emphasizing study in environmental areas can be found under these listings:

College of Agricultural Sciences
- Agricultural and Extension Education, Environmental Science option
- Agroecosystems Science
- Environmental and Renewable Resource Economics
- Environmental Resource Management
- Environmental Soil Science
- Forest Science
- Landscape Contracting
- Wildlife and Fisheries Science

Altoona College
- Environmental Studies

College of Arts and Architecture
- School of Architecture and Landscape Architecture:
  - Architecture
  - Landscape Architecture

College of Earth and Mineral Sciences
- Climatology
- Earth Sciences
- Earth Systems
- Energy, Environmental, and Mineral Economics
- Environmental Systems Engineering
- Geography
- Geosciences
- Mining Engineering
- Petroleum and Natural Gas Engineering
- Watershed and Water Resources

College of Education
- Environmental Education Teacher Certificate (contact 228 Chambers Building, University Park campus)

College of Engineering
- Aerospace Engineering
- Agricultural and Biological Engineering
- Architectural Engineering—Environmental Option
- Chemical Engineering
- Civil and Environmental Engineering
- Electrical Engineering
- Engineering Science
- Industrial and Manufacturing Engineering
- Mechanical and Nuclear Engineering
- Science, Technology, and Society

College of Health and Human Development
- Recreation and Park Management

Intercollege Undergraduate Programs
- Environmental Inquiry
- Marine Sciences

INTERCOLLEGE UNDERGRADUATE PROGRAMS

Intercollege undergraduate programs draw on the resources of faculty and courses from several colleges and academic units within the University. Currently offered are the Bachelor of Philosophy degree program, and minors in Astrobiology, Environmental Inquiry, Gerontology, Marine Sciences, Military Studies, and Neuroscience. Descriptions of the minors can be found in the Academic Minors section of this bulletin.

INTERNATIONAL PROGRAMS

Penn State's International Programs comprises two core units, the Education Abroad and International Student Services, which contribute substantially to the University's strategic mission to internationalize its teaching, research, and public service. The faculty liaison and public affairs staff in the office seek to support faculty intiatives to internationalize the curriculum and gain international experience. For more information, visit the IP Web site at **www.international.psu.edu**, call 814-865-7681, or stop by the office in 410 Boucke Building.

EDUCATION ABROAD—Education Abroad (EA) offers a diverse array of international academic opportunities for Penn State undergraduates interested in studying abroad. Overseas programs provide an international perspective on academic disciplines and prepare students for this century's globalized workplace. Penn State's international programs attract approximately 1,000 students annually for full-year, fall, spring, and summer semester programs. The University offers programs in most regions of the world—Europe, the Middle East, the Far East, Latin America, Africa, Australia, and New Zealand.

Undergraduates participating in EA international programs remain registered at Penn State, and courses taken are accredited by the University. As a land-grant institution, Penn State tries to keep overseas study costs affordable, and students studying abroad through Penn State programs have access to many forms of financial assistance. The goal of Education Abroad is to enable students to integrate their international academic experience as seamlessly as possible into their undergraduate curriculum.

Students interested in education abroad should be in good academic standing, and show evidence of maturity, adaptability, stability, self-discipline, and strong academic motivation. Some programs require linguistic and course prerequisites. EA's Web site at **www.international.psu.edu/students_study_abroad** contains detailed information on overseas programs, and peer advisers (students who have studied overseas) are available on a walk-in basis in the Education Abroad Resource Room (412 Boucke Building) to provide preliminary information. Education Abroad advisers work in partnership with students and their academic advisers to ensure that a study abroad experience fits with departmental requirements.

Students wishing to pursue courses not available through Penn State may undertake independent study abroad. Information about independent programs is available from EA or on their Web site listed above. Students are advised to check the transfer of credit for such programs with Penn State's Office of Undergraduate Admissions.

INTERNATIONAL STUDENT SERVICES—International Students Services (ISS) is responsible for services and programs that aid students from abroad to achieve their academic goals. The office works closely with more than 4,000 international students, handles immigration matters and financial eligibility for admission, acts as a liaison with sponsoring agencies, offers academic and personal adjustment counseling, and provides many other services. In addition, ISS assists with the activities of twenty-four nationality clubs, advises the International Student Council, and acts as an advocate for international student concerns with other University offices and within the community. ISS is responsible for University compliance wtih government regulations applicable to international students and scholars and works closely with the department of Homeland Security, the Department of State, and several other government agencies. The International Hospitality Council, a community volunteer organization, works with ISS by providing programs and services to acclimate international visitors to Penn State. More information about ISS can be found at: **www.international.psu.edu/international_students**

RESERVE OFFICERS' TRAINING CORPS

A student may select Reserve Officers' Training in the Army, Navy, Marine Corps, or Air Force. Subject to the specific requirements of the service chosen, the student selects courses in military, naval, or air science. University credit is given for these courses. In accordance with academic rules, a minimum of 6 credits earned in ROTC courses apply toward graduation requirements in any baccalaureate program. Additional ROTC credits may be applied toward graduation according to the policy of the college or degree-granting unit in which the candidate is enrolled. In many programs, the category to which ROTC credit may be applied is clearly stated. In programs where the category is not predetermined, the student's adviser and the student decide which credits the ROTC credits will replace. There is no military service obligation during the first year of the program regardless of scholarship status. Sophomore students have no obligation unless they are on a military scholarship. See the Reserve Officer Training Corps section in the descriptions of majors for more detailed information about the programs offered.

CONCURRENT AND SEQUENTIAL MAJORS

At the baccalaureate or associate degree level, students may be approved for admission to more than one major under the Concurrent Majors program or the Sequential Majors program. A Concurrent Majors program is one in which students take courses to concurrently meet the requirements of at least two majors, with graduation for all majors in the program occurring during the same semester. A Sequential Majors program is one in which a student has graduated and then reenrolls for another major.

Any student requesting more than one major program shall, for each major, meet the same acceptance standards and graduation requirements as met by all other students. Colleges and departments may identify and should publish any combintations of majors that would not be approved for more than one major program. In general, an undergraduate student may not combine a general major with a departmental major within the same college.

TEACHER EDUCATION PROGRAMS

GENERAL INFORMATION

Under rules promulgated by the Pennsylvania Department of Education, certificates to teach in the public schools of the Commonwealth are issued only to those college graduates who have completed approved teacher education programs and are recommended for the certificates by the University's certification officer, the dean of the College of Education. The Colleges of Agricultural Sciences, Altoona, Arts and Architecture, Commonwealth, Education, and Health and Human Development have been designated by the Board of Trustees as being responsible for the professional preparation of teachers and, accordingly, admit first-year students into bachelor's degree majors that

satisfy academic requirements for certificates to teach all of the subjects offered in most elementary and secondary schools. These majors appear in the majors section of this bulletin, listed under each of the colleges mentioned.

Students enrolled in other Penn State colleges may also qualify for teacher certificates by completing the pertinent academic course work and field experiences in addition to the requirements of their academic majors. Students interested in pursuing such a set of dual objectives should consult with their academic advisers, must meet the special requirements listed below, and must consult with a representative of the University Certification Office, 228 Chambers Building, University Park campus (814-865-0488). This consultation should occur as early as possible, prior to the junior year, so that eligibility criteria and scheduling sequences are reviewed with the candidate.

SPECIAL REQUIREMENTS FOR TEACHER CERTIFICATION CANDIDATES

Policies pertaining to the preparation of teachers, as approved by the Pennsylvania State Board of Education and implemented by the Pennsylvania Department of Education, are published at **www.ed.psu.edu/edservices/certification/new_standards.htm** and are available in printed format at the University Certification Office, 228 Chambers Building, University Park, PA 16802, 814-865-0488. Pennsylvania certification requirements for teacher certificates issued by the Pennsylvania Department of Education include eligibility criteria, such as testing and cumulative grade-point average requirements, which are in addition to Penn State graduation requirements to be met for the baccalaureate degree awarded by Penn State. Academic advisement resources in the students' areas of teacher certification emphasize this distinction.

Entrance to Teacher Certification Programs—A student wishing to gain entrance into a specific teacher certification program must consult an adviser representing that program in order to be fully informed about the implementation details of the following entrance criteria:

1. A minimum cumulative grade-point average of 3.00
2. A grade of C or better in all specified courses, including practica
3. Passing scores from the PRAXIS I PPST for Reading, Writing, and Mathematics
4. Documentation of at least 80 hours of volunteer or paid education work experience with learners of the age group the candidate plans to teach. At least 40 of these age-appropriate 80 hours must be with learners whose cultural, social, or ethnic backgrounds differ from the candidate's own. [Candidates for Special Education must document two separate 40-hour experiences in two different settings, with learners who have special needs. One experience should include learners with a different level of severity or functioning (e.g., mild/severe, young/adult) from those learners in the other experience. One experience should also include learners with cultural, social, or ethnic backgrounds different from the candidate's own.]
5. Completion of an early field experience specified by the certification program
6. Completion of a core of Education courses specified by the certification program
7. Completion of additional credits as specified by the certification program
8. Completion of at least 48 semester credit hours, including English 015 or 030, 3 credits of literature, and 6 credits of quantification
9. Approval from the professional education adviser or the head of the pertinent certification program

Note: Consistent with University policy relating to enrollment capacity, the number of candidates admitted to a program of study each year may be limited.

SCHOOL LAWS AND THE TEACHER—State certification regulations require that an applicant for a teacher's certificate be known by the preparing institution as a person of good moral character, possessing personal qualities, professional knowledge, and skill that warrant issuance of a teacher's certificate (School Laws of Pennsylvania, Article XII). Certification candidates also must be United States citizens not in the habit of using narcotic drugs in any form or excessive amounts of intoxicating beverages (School Code 1209), and not currently under indictment nor convicted of a criminal offense (Act 34).

PENNSYLVANIA DEPARTMENT OF EDUCATION (PDE) TESTS—All applicants for a Pennsylvania Instructional I certificate must present passing scores on the PRAXIS Series/NTE tests on communication skills, general knowledge, professional knowledge, and the specialty area prior to the issuance of the certificate by PDE. The candidates must meet PDE passing scores in effect at the time the candidate's application is received by PDE.

PRECERTIFICATION COMPETENCY EXAMINATION ON EDUCATING THE HANDICAPPED—All candidates seeking Penn State's endorsement for a Level 1 professional certificate must pass this examination successfully. It was developed to meet the Pennsylvania Department of Education's Guidelines for the Preparation of Teachers in Compliance with U.S. Public Law 94-142 more recent legislation. (This exam is waived for candidates successfully completing appropriate courses in Special Education, such as SPLED 400.)

STUDENT TEACHING—Most programs leading to recommendation for teacher certification require more than 260 hours of actual classroom teaching during a fifteen-week student teaching semester. The student teacher is expected to observe and participate in a wide range of learning activities in the classroom and schools where he or she is assigned. Student teaching is a full-time clinical activity designed to assist the preservice teacher to perform specified competencies on a sustained basis in a field setting. Student teaching placements are made in schools with which the University has established cooperative working relationships. Relocation away from the University Park campus is generally necessary for student teachers; thus, University Park campus housing in most instances will not be feasible. Also, transportation to field experience placement sites is the responsibility of the student.

Eligibility for student teaching requires (1) admission to junior standing; (2) satisfaction of the above-named nonacademic requirements for certification; (3) possession of the moral and physical requirements for certification; (4) completion of specified courses with a minimum grade of C (these courses are identified in the program descriptions contained in this bulletin and on the program sheets issued to students at the time of entrance into a certification program); and (5) submission of an application for student teaching to the director's office by the end of the fall semester preceding the academic year desired for a student teaching assignment.

ADDITIONAL INFORMATION—Inquiries about specific teacher preparation programs may be directed to the pertinent departmental unit. General inquiries about teacher education at Penn State may be directed to the Dean, College of Education, The Pennsylvania State University, 275 Chambers Building, University Park PA 16802-3206; **www.ed.psu.edu**.

WASHINGTON PROGRAM

The Penn State Washington Program provides students with semester-long internship experiences appropriate to their majors, interests, and career goals. Internships are unpaid and full-time and are available in environmental groups, congressional committees, special-interest groups, and similar settings in Washington, D.C. Participants are selected on the basis of interests, academic standing, writing ability, references, and an interview. The program is open to juniors and seniors (sophomores are considered on a case-by-case basis), and students can make arrangements to receive credit for their internships. The program also provides housing and special events and programs. For more information, visit: **www.psu.edu/dept/comm/wash**.

Each fall semester, the Communications and Democracy Semester in Washington is offered through the College of Communications; the Agricultural Leadership Program is offered through the College of Agricultural Sciences; and the Capital Semester is offered through the College of the Liberal Arts. Students in the program complete an internship and take Penn State classes in the nation's capital. For more information, see the Web site.

PROGRAMS AND SERVICES FOR STUDENTS

ADULT LEARNER SERVICES, CENTER FOR

Services offered by the center include: general counseling; new-student outreach; advocacy on behalf of adult learner issues; seminars and programs on topics of interest to adult learners; lounge/kitchen/study facilities; and information about admission, financial aid, careers, child care, housing, registration, and University policies and procedures. The office is open daily from 8:00 a.m. to 5:00 p.m., and until 7:00 p.m. during fall and spring semesters. The office is located at 204 Boucke Building and may be reached by calling 814-863-3887, or check the Web at **www.sa.psu.edu/cals/**.

ATHLETICS AND RECREATION

FACILITIES—The University has athletic facilities equal to those of any institution in the country. At the University Park campus, there are six modern gymnasiums; fifty-one outdoor and four indoor tennis courts; one outdoor and four indoor swimming pools; two eighteen-hole golf courses; Beaver Stadium (approximately 106,600 capacity); Bryce Jordan Center, a basketball/sports/entertainment complex (maximum capacity 16,500); fieldhouse; indoor sports complex; ice-skating rink; twenty-six handball and paddleball courts; sixteen squash courts; indoor and outdoor running tracks; a baseball field; lighted intramural fields for football, soccer, and softball; two indoor artificial turf practice fields; Jeffrey Field for soccer and lacrosse; thirty-two acres of practice fields; a four-mile jogging course, plus rooms for weight training, fencing, archery, golf, body mechanics, dance, gymnastics, adaptives, and wrestling. The Stone Valley Recreation Area (fourteen miles from the University Park campus) is available for sailing, boating, hiking, picnics, fishing, and cross-county skiing. Stone Valley also is the site of an excellent nature environmental center, which is open to the public year-round.

Penn State's other locations across the Commonwealth also have facilities for a wide range of student activities.

INTERCOLLEGIATE ATHLETICS—The University Park campus Intercollegiate Athletics program offers twenty-nine varsity sport teams: fifteen for men and fourteen for women. Intercollegiate teams for men are baseball, basketball, cross-county, indoor track, outdoor track, fencing, football, golf, gymnastics, lacrosse, soccer, swimming, tennis, volleyball, and wrestling. The intercollegiate teams for women are basketball, cross-country, indoor track, outdoor track, fencing, field hockey, golf, gymnastics, lacrosse, soccer, softball, swimming, tennis, and volleyball. All students who have received medical clearance may participate in these sports, subject to rules and regulations governing intercollegiate competition.

All Penn State undergraduate locations offer athletic programs for both men and women. These programs vary from campus to campus. Varsity sport teams in baseball, basketball, cross-country, field hockey, golf, soccer, softball, swimming, tennis, and volleyball are fielded within the campus system. Students who have received medical clearance from the appropriate medical personnel at their respective campus may participate in these sports subject to the University rules and regulations governing such competition.

RECREATIONAL SPORTS—The intramural program offers tournament competition for men, women, and coed tournaments. This year-round program is composed of the following sport tournaments: badminton, basketball, bowling, cross-country, field hockey, football (flag and touch), golf, handball, racquetball, soccer, softball, squash, swimming, tennis, track, volleyball, and wrestling.

Fitness activities are offered across campus for the entire University community. These include aerobics, step aerobics, aquasize, etc.

Fifty-six clubs and interest groups meet on a regularly scheduled basis throughout the year. Some of these are designed for performance purposes, others mandate an interest in competitive experience, and a number function to provide students with the opportunity to further their recreational pursuits and interests.

The University and its facilities, as well as the surrounding natural resources, offer unusual opportunities for voluntary student and faculty recreation. Individual students and faculty may take advantage of the many indoor and outdoor facilities during open recreational hours. A recreation program designed for faculty and staff is also available.

CAREER SERVICES

Career Services, located at MBNA Career Services Center on the University Park campus, provides counseling and placement services to assist students in their career development and in formulating and implementing both short- and long-range career plans. Some specific services and programs offered by Career Services are:

Intake (112 MBNA Career Services Center)—An intake counselor is available weekdays from 8:30 a.m. to 5:00 p.m. to answer questions on career planning or placement, and to refer students to other appropriate services.

Counseling Services—Counseling staff members are available to meet with students individually and in groups to assist with issues such as the choice of major, clarification of career plans, job search skills, and graduate school plans. Information resources and educational programs described below often are used to help students assess their abilities, attitudes, values, and interests, and to relate these to job and career opportunities so that they can make appropriate educational and vocational plans.

Computer-Assisted Guidance and Assessment—DISCOVER and SIGI-PLUS provide a broad database of information about education and occupations, as well as self-exploration and decision-making exercises. Students using DISCOVER or SIGI-PLUS can identify interests, values, and abilities relevant to the world of work; create and refine a list of occupations based on factors of their choice; and obtain information about academic majors, many technical or graduate programs, and more than 450 occupations. Other computer-based interest and career-related assessments are available through the counseling process.

Career-Planning Courses (for credit)—Staff members teach courses for credit in three of the academic colleges: Agricultural Sciences, Education, and the Liberal Arts. Topics include determining career goals, identifying potential employers, formulating effective job-search strategies, preparing a résumé, and improving interview techniques. CN ED 100 Effective Career Decision Making focuses on factors that influence decision making, career, and major choice.

Outreach Programs/Seminars—Several hundred seminars and outreach programs are offered each year on a wide range of topics such as résumé writing, interview skills, job-search strategies, internships, graduate school applications, and effective use of the on-campus interviewing system. The locations of these programs are announced in the *Daily Collegian*, on posters, and in fliers. To schedule a program, individuals and groups should call Career Services.

Career Library (115 MBNA Career Services Center)—The Career Library contains informational resources on hundreds of occupations, internship and summer job directories and vacancy announcements, graduate/undergraduate school directories, Penn State majors files, employer directories, and job-search/career-planning publications.

The Interview Training Center (113 MBNA Career Services Center)—was a gift of the Senior Class of 1987–88. Designed to enhance students' interviewing skills, it houses a permanent studio composed of video recording and playback equipment for conducting mock interviews. Playback units for viewing job-search training videotapes are also a part of this facility.

Placement Services—Career Services cooperates with the colleges and departments of the University to assist students in implementing career plans upon graduation. Services include (1) scheduling interviews for students with more than 950 prospective employers who visit the campus; (2) notebooks of employment opportunities for which a student may apply by mail; (3) Nittany Lion Job Link, a vacancy listing service accessible via the Internet; (4) a listing of career-related summer jobs and internships; (5) workshops on interviewing skills and résumé preparation; and (6) a variety of informational meetings and publications.

Employment Resources (115 MBNA Career Services Center)—Contains information on about 1,200 organizations. Information on state and federal government employment, handouts about career-planning and job-search strategies, and notebooks containing immediate openings are available.

Education Credentials Services (105 MBNA Career Services Center)—Students and alumni seeking teaching or administrative positions in elementary, secondary, or higher education, or positions in nursing, can register with Education Credentials Services. Copies of credentials are sent to schools at the candidate's request. Registration for the first year is free for students and $35 per year thereafter. The first five copies of the file are sent at no cost. Education Credentials Services also has directories listing school districts and higher education institutions across the country and produces an online vacancy listing. Career counselors are available to students by appointment to discuss planning a career in education.

COUNSELING AND PSYCHOLOGICAL SERVICES, CENTER FOR

The center provides comprehensive psychological and psychiatric services to full-time students. Group and individual counseling provides safe, confidential opportunities for students to explore the issues of relevance to them, gain awareness and insight into themselves, and become increasingly active in taking charge of their lives. Feelings of loneliness, inadequacy, family or marriage difficulties, lack of confidence, the inability to concentrate or study, or simply "feeling the need to talk things out" are all examples of concerns that may be dealt with through personal counseling.

The Center for Counseling and Psychological Services (CAPS) offers the following:

1. Counseling—for individuals and groups; personality testing; crisis intervention; psychiatric services; referral services. Time-limited treatment is provided free of charge to any full-time student currently enrolled at Penn State.
2. Therapy groups—to address concerns such as stress reduction, eating disorders, women's issues, and others.
3. Consultation—with campus groups or organizations to assist in dealing with problems within the organization or to explore more effective ways of functioning. Consultation is also available to faculty or staff to assist them with students under emotional stress, in making referrals for counseling, and by providing classroom presentations on relevant topics.
4. An emergency intervention system—operating during regular business hours. Students may walk in to 221 Ritenour, or call 863-0395. After hours and on weekends, call the Centre County Can Help Line at 1-800-643-5432.
5. A staff of experienced practitioners—in the specialities of clinical/counseling psychology, psychiatry, and social work.
6. Confidentiality is maintained—no information is released without the written consent of the student. The counselors subscribe to the ethics and guidelines established by the professional groups with which they identify.

The center can be contacted for an appointment by stopping at the office, 221 Ritenour Building, University Park campus, or by calling 814-863-0395, between 8:00 a.m. and 5:00 p.m., Monday through Friday.

DISABILITY SERVICES, OFFICE FOR

Penn State encourages academically qualified students with disabilities to achieve full participation and integration in its educational programs. It is Penn State's policy not to discriminate against qualified persons with disabilities in its admission policies and procedures or its educational programs, services, and activities. The University is responsible for ensuring that courses, programs, services, jobs, activities, and facilities are available and usable in the most integrated and appropriate settings.

ELIGIBILITY FOR SERVICES

Individuals who are seeking services through the Office for Disability Services (ODS) must self-disclose their need for the services or academic accommodations to ODS at University Park or to the Disability Contact Liaison (DCL) at other Penn State locations. To be eligible for academic accommodations through ODS or at other Penn State locations, students must have a documented disability as defined by the Rehabilitation Act, 1973, or the Americans with Disabilities Act (ADA), 1990. The ADA defines a disability as a physical or mental impairment that substantially limits a major life activity.

Individuals seeking academic accommodations from ODS are required to provide diagnostic documentation from a licensed clinical professional familiar with the history and functional limitations of the student's impairments. All documentation must adequately verify the nature and extent of the condition in accordance with current professional standards, techniques, and practices. Also, the documentation must clearly substantiate the need for the student's specific accommodation requests. All documentation must be submitted on the official letterhead of the professional. The report should be typed, dated, signed, and include the professional credentials of the evaluator, including information regarding licensure or certification. The cost of obtaining documentation is borne by the student. If the initial documentation is incomplete or inadequate to determine the extent of the disability and reasonable accommodations, the office has the discretion to require additional documentation.

Penn State's guidelines for appropriate documentation and the forms necessary for each disability category can be obtained by contacting ODS at 116 Boucke Building; telephone 814-863-1807 (V/TTY) or by downloading the forms from the Student Information section of the ODS Web site at **www.equity.psu.edu/ods/student/student_info.asp**. Students attending any Penn State location should submit their documentation to the ODS or the appropriate disability contact liaison once they have been officially admitted to the University. Students seeking services or accommodations from ODS must seek assistance in a timely manner.

ETHICS AND RELIGIOUS AFFAIRS, CENTER FOR

The center offers out-of-class educational programs that focus on the values of community life, social issues and challenges, and spiritual and religious opportunities. Further, the staff in religion provides services in the areas of worship, pastoral counseling, and religious education to students who wish to exercise their freedom to practice a religion of their choice. The center is located in the Pasquerilla Spiritual Center-Eisenhower Chapel on the University Park campus, which includes campus faith group offices, lounges, meditation chapels, and several multipurpose rooms.

FRATERNITY AND SORORITY LIFE

Located in 209 HUB-Robeson Center at University Park, Fraternity and Sorority Life coordinates the activities and programs of the Multicultural Greek Council, National Pan-Hellenic Council, Panhellenic Council, and Interfraternity Council. The office informs the University and other communities about the achievements and contributions of Penn State's eighty-nine fraternities and sororities. For more information, see **www.sa.psu.edu/greeks**.

HEALTH SERVICES, UNIVERSITY

When students are sick or need health care advice, University Health Services (UHS) is their resource on University Park campus. UHS provides high-quality health services to all eligible Penn State students who are enrolled for the current semester, as well as to the spouses of students who are enrolled in one of the Penn State Student Health Insurance Plans. Experienced and caring professionals provide a wide range of services including primary care, preventive medicine, and health education.

Prior to their initial registration, all new degree-seeking students entering the University must submit the completed Penn State health history form, including proof of adequate immunization against measles, mumps, and rubella. The completed form constitutes a vital part of the student's medical record. Students are also encouraged to send a copy of their medical records from their current primary health care provider to the health center if they have an ongoing medical condition that might require special attention.

The health services of the University are made available to students in accordance with a statement provided by each campus, pertinent to that campus, and published in its student handbook.

Services

UHS provides emergency transportation services on University Park campus through University Ambulance Services and its EMS office twenty-four hours a day, seven days a week. dial 911. If students have health questions or are not sure if they need to be seen by a clinician, telephone advice nurses are also available twenty-four hours a day, seven days a week at 863-4463.

All medical emergencies are seen immediately, and UHS offers same-day appointments for other pressing medical needs. Primary health care, men's health visits, and an immunization clinic for allergy shots are provided through the General Medicine Department. Gynecological services and contraception counseling are offered by the Women's Health Department. The Office of Health Promotion and Education offers a Nutrition Clinic and educational activities that promote health awareness, positive health behaviors, and disease prevention.

For convenient, one-stop service, students have access to a pharmacy, clinical laboratory, X-ray, and physical therapy services on-site at the main clinic in Ritenour Building. The UHS pharmacy fills prescriptions and sells over-the-counter products at a special rate.

Locations—Our main facility in the Ritenour Building is conveniently located at the corner of Shortlidge and Pollock Roads (diagonal from the Hub-Robeson Center). A General Medicine satellite clinic is located in East Halls (Johnston Commons) and a Women's Health Clinic is in Shulze Hall.

Hours—Our main clinic in Ritenour is open Monday, Tuesday, Thursday, and Friday from 8:00 a.m. to 5:00 p.m., and Wednesday from 9:00 a.m. to 5:00 p.m. Urgent care is available on Saturdays during the fall and spring semesters from 11:00 a.m. to 3:00 p.m. The hours of service at the satellite clinics may vary.

Fees—There is a basic clinic visit fee of $20 on weekdays and $26 on Saturdays for students during the 2004-05 academic year. This fee covers most supplies and procedures performed at UHS. There are additional charges for laboratory tests, X-rays, physical therapy treatment, pharmacy, and ambulance services.

If students are not covered by the Penn State Student Insurance Plan, they must pay at the time of service by either having the charge billed to their Penn State student account or paying by check, cash, VISA, or MasterCard. However, they can then submit the receipt for these services to their insurance company for possible reimbursement (which depends on the extent of their insurance coverage). UHS recommends that all students find out ahead of time what services their insurance policy will cover.

Health insurance is required for international students, their spouses, and children.

Important UHS Phone Numbers

Ambulance: 911
Appointments:
General Medicine Department: 863-0774
Women's Health Department: 863-2633
Telephone Advice Nurse: 863-4463
Information Desk: 865-6556
Additional information is available on the UHS Web site at **www.sa.psu.edu/uhs**.

INFORMATION TECHNOLOGY SERVICES (http://its.psu.edu)

Information Technology Services (ITS) ensures that faculty, students, and staff have the information technology tools and infrastructure necessary to carry out the University's mission. ITS provides the infrastructure that enables members of the Penn State family to make maximum use of the appropriate information technology tools in their learning, teaching, research, outreach, administration, and support activities, and the cost-effective information technology resources required to support continuous improvement in the University's ability to fulfill its diverse mission.

ITS is working to achieve five broad goals:

—Help faculty improve the way education is delivered.

—Provide students with resources to enrich their educational experience.

—Create and sustain an environment that enables leading-edge research.

—Help to improve productivity.

—Establish the information technology infrastructure necessary to maintain Penn State's preeminence in integrating high-quality programs in teaching, research, and outreach.

The necessary infrastructure, services, and resources are provided through the Office of the Vice Provost for Information Technology and its seven operating units:

Academic Services and Emerging Technologies: Designs, develops, and operates the information technology infrastructure necessary to deliver technology services in support of students, faculty, and staff in their teaching, learning, and research endeavors. Performs research and development in information technology for the purpose of developing, defining, and promoting an information technology architecture that positions the institution to take advantage of rapidly emerging opportunities.

Administrative Information Services: Serves as the central University resource responsible for supporting administrative information systems. Participates in the development, maintenance, and secure operation of the state-of-the-art applications using centralized student, business, and alumni databases.

Consulting and Support Services: Provides an interface for the services offered throughout ITS. Its mission is to provide the highest level of service to students, faculty, and staff through individual and departmental consulting, help desks, and the development of new services.

Digital Library Technologies: Provides access to electronic resources and services for students, faculty, and staff in support of the instructional, research, and public service programs of the University. Provides computing solutions to support the University Libraries' programs and services. Provides technical leadership in research and development of digital libraries initiatives.

Security Operations and Services: Focuses on developing, interpreting, and enforcing University computer and network security policies. Responsible for incident response and providing forensic and litigation support, risk assessments, and vulnerability assessments. Provides education, awareness, and advice on security issues and policies.

Teaching and Learning with Technology: Helps faculty enrich the educational experience of students through wise use of technology by providing classrooms, labs, courseware, and specialized services. Through a training program, provides faculty, staff, and students with the skills they need.

Telecommunications and Networking Services: Responsible for developing, designing, installing, and maintaining comprehensive telecommunications services within and among University locations and outside networks to accommodate University communication needs.

For additional information about Information Technology Services, see **http://its.psu.edu** on the Web.

JUDICIAL AFFAIRS

The office of Judicial Affairs' primary mission is to support the University's education mission and goals by promoting a just, safe, orderly, and positive climate through behavioral standards, disciplinary processes, training, informational programming, and intervention efforts.

The office offers redress to complainants; it provides those accused of violations of the Code of Conduct (as outlined in *Policies and Rules,* available on the Web at **www.sa.psu.edu/ja/pdf/disc_procedures.pdf**) due process in answering allegations; it provides support to all students and interprets University policies and procedures for community members; it provides sanctions or other educational interventions to students who have been found responsible for misconduct. The office is inclusive in utilizing student input into the discipline process. The office recruits, selects, and trains students and staff in assisting in the operation of the University's judicial system.

LEGAL SERVICES

Legal Services, located in 205 HUB-Robeson, provides students with a part-time attorney who supervises the delivery of legal information and advice on a wide range of legal issues.

MULTICULTURAL RESOURCE CENTER

The Multicultural Resource Center offers personal and academic counseling to undergraduate students who are members of underrepresented racial/ethnic groups. Programs and services are designed to facilitate adjustment to the University and to assist students in achieving their academic goals. The office is located in 220 Grange Building, University Park campus, telephone 814-865-1773 or **www.equity.psu.edu/mrc**.

OFF-CAMPUS LIVING

We assist students in locating off-campus housing and provide them with educational brochures, programs, and strategies to become better-educated consumers. Students can search for off-campus living through our listing service, Housing Fair, on the Web at **www.sa.psu.edu/ocl**, or by visiting the office in 209 HUB-Robeson Center.

PAUL ROBESON CULTURAL CENTER

The Cultural Center, on the ground floor of the HUB-Robeson Center, serves as a vehicle for the education and socialization of all members of the University community, with particular emphasis on African American students and other underrepresented groups. The Cultural Center's programs stress the historic, current, and future roles of the many forms of African American culture. The Robeson Center serves to broaden the understanding, widen the perceptions, and increase acceptance among individuals in a multicultural community.

RESIDENCE LIFE

Professional and peer (resident assistant) staff provide on-campus residence hall environments that support the continued growth and learning of students. In addition to being concerned about the safety and security of on-campus students, residence hall staff assist students in their adjustments to a new living/learning setting. Staff members work to build a community in which there is respect and appreciation for persons with different backgrounds, beliefs, and experiences.

STUDENT AND FAMILY SERVICES

Located in 210 HUB-Robeson, University Park campus, this office provides students and other members of the University community with information, referrals, assistance with family emergencies, intolerance and sexual harassment reporting, and other services. Between 5:00 p.m. and 8:00 a.m. daily, Lion Support provides assistance and information, or a listening ear. Call 863-2020.

UNDERGRADUATE STUDENT GOVERNMENT

The Undergraduate Student Government (USG) is a representative system composed of three branches—executive, legislative, and judicial—that forms the core of the student government. It governs and coordinates functions within the realm of the undergraduate student body. USG is the formal representative of University Park campus undergraduate students to the University Faculty Senate and administration.

UNIONS AND STUDENT ACTIVITIES

ASSOCIATED STUDENT ACTIVITIES (ASA)—Located in 241 HUB-Robeson Center, ASA assists registered student organizations in monitoring and advising on fiscal issues and responsibilities and keeping proper accounts in their financial activities.

HETZEL UNION BUILDING—The HUB, which is administered by the Director of Unions and Student Activities, is the major activity center on campus. It is an integral part of the institution's educational environment, providing services, facilities, and a wide range of educational programs. The HUB features space for study, recreation, crafts, social activity, meetings, musical events, lectures, and art appreciation. Food services and a professionally staffed information center are among the many services provided through the HUB.

STUDENT ACTIVITIES—Located in 207 HUB-Robeson Center, Student Activities was created to serve students and their organizations by providing consultation on leadership development, community service opportunities, and guidance on how to make the most of their out-of-class experience. The AT&T Center for Service Leadership offers students, staff, and faculty service-learning opportunities through educational programs, volunteerism, and leadership development. Students are always welcome to stop in and meet with a member of our professional staff to determine strategies for improving the functioning of an organization, or the many opportunities for involvement at Penn State.

UNIONS AND STUDENT ACTIVITIES, OFFICE OF—This office strives to reinforce the fact that the students' out-of-class experience is a vital part of their education. The office manages the HUB-Robeson Center and presents its many programs. Services are made available to support student organizations and activities, schedule union facilities and services, program several visual art galleries, operate a billiard room and electronic games area, administer a Center for Arts and Crafts (including a ceramic studio) with related classes and workshops, and provide a full-service information center.

UNIVERSITY LEARNING CENTERS (ULC)

The University Learning Centers, with three locations at University Park campus (Johnston Commons, 7 Sparks Building, and a main office in 220 Boucke Building) as well as locations at all Penn State undergraduate campuses, provides a wide range of support to all undergraduate students. Their free services include peer tutoring through the Math Center, Supplemental Instruction Program, Tutoring Center, Undergraduate Writing Center, and the Language Center. Additionally, some campuses have learning consultants who are available to work with individuals or groups on developing better learning and study skills. In addition, at University Park and some other campus locations, tehcnology tutors provide assistance in using state-of-the-art learning technologies such as digital video-editing computers, audiocassettes, courseware, computers, videos, and other technologies. For additional information, contact your campus's ULC or visit the ULC Web site at **www.ulc.psu.edu**. Additional information at University Park campus is available by stopping by 220 Boucke Building or calling 814-865-1841.

VETERANS PROGRAMS, OFFICE OF

The Office of Veterans Programs provides services for veterans, eligible dependents, and reservists. These services include outreach and enrollment assistance; professional counseling on academic, financial, and personal matters; certification for veterans' benefits. Information is available in 325 Boucke Building; telephone 814-864-0465 or **www.equity.psu.edu/veterans**.

WOMEN IN THE SCIENCES AND ENGINEERING (WISE) INSTITUTE

The primary mission of the Women in the Sciences and Engineering (WISE) Institute is to enhance the entry and success of women in the Sciences, Mathematics, Engineering, and Technology (SMET) fields at all levels to achieve gender balance at Penn State. The WISE Institute coordinates with the colleges across the University, K-12, and external advisory members to leverage women's participation in the SMET fields, where women are underrepresented. The WISE Institute collaborates with the Commission for Women (CFW), the Center for Women Students, and the Women's Studies program. The institute plays a central role in the WISE women student organizations on campus: Association for Women in Science (AWIS—undergraduate chapter); Graduate Women in Science (GWIS); Sigma-Alpha (professional sorority for women in the College of Agricultural Sciences); Society for Women Engineers (SWE); WISE Interest House; and Women in Information Sciences and Technology (WIST). The institute serves as an advocate for women at Penn State. Information is available in 111G Kern Building; telephone 814-865-3342; e-mail, WISE@psu.edu; online, **www.equity.psu.edu/wise**.

WOMEN STUDENTS, CENTER FOR

The Center for Women Students (CWS) provides advocacy, referrals, and resources to women students at Penn State. Informational materials and educational programming are available on issues including sexual assault/rape, relationship violence, sexual harassment/stalking, classroom climate, and body image.

CWS maintains an extensive archival collection of written materials on various topics. Programs are in the form of presentations in classrooms and residence halls, and for student organizations. Trained peer educators are also available for facilitation.

We are committed to serving all women in the spirit of diversity and social justice. Men students who are concerned about these issues or who have experienced them in their own lives are encouraged to use our services.

Our main office, 135 Boucke Building, and Resource Room, 120 Boucke, are open from 8:00 a.m. to 5:00 p.m., Monday through Friday. For more information, call 814-863-2027 or visit our Web site **www.sa.psu.edu/cws**.

HONOR AND PROFESSIONAL SOCIETIES

Many national and local organizations have student chapters at Penn State. For a comprehensive list, visit **www.sa.psu.edu/usa/studentactivities/usermain.asp** on the Web. For additional information, contact the Student Activities office at 814-863-3786.

College Information

NOTE

Information in this section was current as of February 25, 2004. Please see the Undergraduate Bulletin on the Web for more current information: **www.psu.edu/bulletins/bluebook**

INFORMATION ON FACULTY IN CHARGE

See the Undergraduate Bulletin on the Web: **www.psu.edu/bulletins/bluebook** for current faculty in charge of specific academic programs if not listed in this section, or contact the specific college for further information.

ABINGTON COLLEGE

KAREN WILEY SANDLER, *Dean and Campus Executive Officer*
HANNAH KLIGER, *Associate Dean*

COLLEGE ACADEMIC ORGANIZATION

Arts and Humanities Division — DAVID A. RUTH, *Head*
Continuing Education — JANE A. OWENS, *Director*
Library — CLAIRE HOFFMAN, *Head Librarian*
Registrar — PATRICIA SMITH
Science and Engineering Division — PAUL HUTTA, *Head*
Social Science Division — JAMES F. SMITH, *Head*
Undergraduate Studies, Division of — JANET PETKOV, *Acting Coordinator*

INTRODUCTION

Penn State's Abington College, located on forty-five picturesque acres in suburban Philadelphia, offers a small-university environment within the context of a major university. Students beginning their academic careers at Penn State Abington have the flexibility to complete their degrees at Abington, University Park, or at one of the several other Penn State locations around the state.

The college also offers a full range of academic and student support services, including a lower-division college, an honors program, an upper-division Schreyer Honors College program, internships, undergraduate research with faculty, state-of-the-art computer facilities, a learning center, a wide range of student clubs and organizations, varsity and club sports, and a career development center. For additional information, please contact the Office of Admissions, Penn State Abington, 1600 Woodland Road, Abington, PA 19001; 215-881-7600; **www.abington.psu.edu.**

In addition to offering the lower-division courses of more than 160 Penn State majors, Penn State Abington offers baccalaureate degree programs that can be completed at Penn State Abington: Administration of Justice; American Studies; Business; Corporate Communication; English; History; Information Sciences and Technology; Integrative Arts; Letters, Arts, and Sciences; Psychological and Social Science; Science

CONTINUING AND DISTANCE EDUCATION

Penn State Abington offers one of the most comprehensive professional development programs in the Philadelphia region. Workshops, seminars, and certificate programs are offered on campus year round. State-of-the-art computer labs and courses, designed to keep pace with a rapidly changing market, are available through Abington's Center for Information and Computer Technology. In addition, corporate on-site training and development, and credit programs are provided, tailored to the needs of area businesses and organizations. Visit Penn State Abington's Continuing and Distance Education site at **www.abington.psu.edu/div_outr.htm** on the Web.

GENERAL GRADUATION REQUIREMENTS

All baccalaureate degree candidates must follow the graduation requirements as established by the University Faculty Senate:

1. Minimum of 2.00 cumulative grade-point average.
2. Completion of minimum total credits for graduation. Descriptions are available in this bulletin for the minimum number of credits required for each major.
3. Completion of all General Education, college (B.A. degrees only), elective, and major requirements.
4. All courses fulfilling major requirements must be completed with a grade of C or higher.
5. Students wishing to graduate with a minor must apply for the minor no later than the end of the semester prior to graduation. All required course work must be completed with a C or higher by the end of the semester the student plans to graduate.
6. Students in Bachelor of Arts degree programs must complete level 3 of a foreign language with a D or higher.
7. Students in Bachelor of Science degree programs must have either 2 Carnegie Units of foreign language completed prior to admission to Penn State, or a grade of C or higher in college-level 1 or 2 of a foreign language, or a grade of D or higher in college-level 3.

Note:

1. ENGL 004, 005; MATH 001, 002, 003, 004, and ESL 004 (SPCOM 004) cannot be counted toward the total number of credits required for graduation.
2. Although a student may repeat a required course in which a grade of D was received, the credits for such a course may by counted only once toward the total number of credits required for graduation.

See **www.psu.edu/bulletins/bluebook/gened/bad.html** for courses that meet University-wide bachelor of arts degree requirements.

COLLEGE OF AGRICULTURAL SCIENCES

ROBERT D. STEELE, *Dean*
PAUL J. WANGSNESS, *Senior Associate Dean*
THEODORE R. ALTER, *Associate Dean*
BRUCE A. McPHERON, *Associate Dean*
JAMES H. MORTENSEN, *Associate Dean*

COLLEGE ACADEMIC ORGANIZATION

Agricultural and Biological Engineering — ROY E. YOUNG, *Head*
  Agricultural and Biological Engineering — PAUL H. HEINEMAN, *Program Coordinator*
  (offered jointly with the College of Engineering)
  Agricultural Systems Management — DENNIS R. BUCKMASTER, Program Coordinator
Agricultural Economics and Rural Sociology — STEPHEN M. SMITH, *Head*
  Agricultural Business Management — JILL FINDEIS, *Program Coordinator*
  Environmental and Renewable Resource Economics — JILL FINDEIS, *Program Coordinator*
Agricultural and Extension Education — BLANNIE E. BOWEN, *Head*
  Agricultural and Extension Education — DENNIS C. SCANLON, *Program Coordinator*
  Agricultural Science — DENNIS C. SCANLON, *Program Coordinator*
Crop and Soil Sciences — DAVID M. SYLVIA, *Head*
  Environmental Soil Science — DANIEL D. FRITTON, *Program Coordinator*
  Turfgrass Science — THOMAS L. WATSCHKE, *Program Coordinator*
Dairy and Animal Science—TERRY D. ETHERTON, *Head*
Entomology — GARY W. FELTON, *Head*
Food Science — JOHN FLOROS, *Head*
  STEPHANIE DOORES, *Program Coordinator*
Forest Resources (School of) — CHARLES H. STRAUSS, *Director*
  Forest Science — LARRY McCORMICK, *Program Coordinator*
  Wildlife and Fisheries Science — LARRY McCORMICK, *Program Coordinator*
  Wood Products — LARRY McCORMICK, *Program Coordinator*
Horticulture — DENNIS R. DECOTEAU, *Head*
  Horticulture — CHARLES W. HEUSER, *Program Coordinator*
  Landscape Contracting — DAN T. STEARNS, *Program Coordinator*
Plant Pathology — LEONARD J. FRANCL, *Head*
Poultry Science — ROBERT G. ELKIN, *Head*
Veterinary Science — C. CHANNA REDDY, *Head*

INTERDEPARTMENTAL PROGRAMS
Agroecology — MICHAEL C. SAUNDERS, *Program Coordinator*
Animal Bioscience — LESTER C. GRIEL, *Program Coordinator*
Animal Sciences — ERSKINE H. CASH, *Program Coordinator*
Environmental Resource Management — ROBERT D. SHANNON, *Program Coordinator*

INTRODUCTION

The COLLEGE OF AGRICULTURAL SCIENCES is concerned with the conduct of education and research programs dealing with the proper utilization of land and water resources for the production of crops, livestock, and forest products to meet food and fiber needs, as well as plants for aesthetic use; protection and management of the environment, with its many ecological systems, so that it may be enjoyed by all; operation of agriculturally related industries that provide professional services to producers who process and market farm products; and the development of human resources and community services.

Agriculture is a science, a business, and a profession that requires many well-educated people to meet the demand for animal and plant specialists, conservationists, food technologists, environmental resource managers, engineers, veterinarians, entomologists, farm and forest managers, and many other agricultural professions. The college carries out its responsibilities through instruction, research, and extension. These activities are described more fully below.

UNDERGRADUATE EDUCATION

A WIDE RANGE of majors in the College of Agricultural Sciences offers students almost unlimited opportunities to merge their natural inclinations, talents, and specific individual abilities.

FOUR-YEAR MAJORS are Agribusiness Management, Agricultural and Biological Engineering, Agricultural and Extension Education, Agricultural Science, Agricultural Systems Management, Agroecology, Animal Bioscience, Animal Sciences, Environmental and Renewable Resource Economics, Environmental Resource

Management, Environmental Soil Science, Food Science, Forest Science, Horticulture, Landscape Contracting, Turfgrass Science, Wildlife and Fisheries Science, and Wood Products.

Students who are interested in studies in plant pathology can enroll in the undergraduate majors in Agronomy, Horticulture, or Forest Science.

First-year students in a four-year program in the College of Agricultural Sciences study basic courses common to all majors. By deferring the selection of a major until the end of the sophomore year, students are given the opportunity to explore their interest areas and to acquire a better basis for making a decision.

A faculty adviser guides each student in choosing his or her course of study. Advisers are available throughout a student's college career to help plan course schedules and to assist with scholastic problems.

Admission requirements for the college are listed in the Admission portion of the General Information section of this bulletin. The major in Agricultural and Biological Engineering is jointly administered by the Colleges of Agricultural Sciences and Engineering. Students who are interested in this major should consult requirements for admission to the College of Engineering.

Information on programs leading to the M.S. and Ph.D. degrees is given in the Penn State *Graduate Degree Programs Bulletin.*

MINOR programs enable students to supplement their four-year major. Minors are offered in Agribusiness Management, Agricultural and Biological Engineering, Agricultural Communications, Agricultural Economics and Rural Sociology, Agricultural Mechanization Technology, Agronomy, Animal Sciences, Environmental and Renewable Resource Economics, Environmental Resource Management, Evironmental Soil Science, Equine Science, Forest Science, Horticulture, International Agriculture, Leadership Development, Mushroom Science and Technology, Off-Road Equipment, Plant Pathology, Wildlife and Fisheries Science, Wood Products Marketing, and Youth and Family Education.

TWO-YEAR MAJORS in Agricultural Business, Forest Technology, and Wildlife Technology lead to the associate degree. Students in these majors, who must begin study of technical subjects the first year, are given all possible assistance in planning their work by their faculty advisers.

TEACHER CERTIFICATION PROGRAM — Agricultural students may qualify for certification to teach in the public school systems of Pennsylvania by completing the minimum course requirements of a subject matter field and the professional education requirements, which include student teaching. Professional courses are taken in the Department of Agricultural and Extension Education, College of Agricultural Sciences, and the College of Education. Students who are interested in teacher certification should see Teacher Education Programs.

PRE-VETERINARY MEDICINE — Although Penn State has no pre-veterinary medicine major, students can prepare for admission to veterinary school through a carefully selected major in the College of Agricultural Sciences. In most cases, students are not accepted to veterinary school prior to the completion of four or more years of college. Because of the limited number of admissions to veterinary schools, each candidate should select an undergraduate program that offers alternatives as well as preparation for admission to the professional program. The wide number of electives allowed in undergraduate majors in the College of Agricultural Sciences provides students with the opportunity to obtain strong preprofessional preparation in majors such as Animal Bioscience, Animal Sciences, and Wildlife and Fisheries Science.

Students who want to pursue studies in other disciplines of agriculture or in other colleges may obtain information about veterinary school admission requirements by contacting members of the faculty of the veterinary science, dairy and animal science, and poultry science departments.

CERTIFICATE PROGRAMS, CONFERENCES, SHORT COURSES

Certificate programs, conferences, and short courses are offered in agriculture and related areas, including programs of formal instruction of variable periods or short-course conference educational activities that may last from one day to several weeks.

Two certificate programs provide training in agriculturally related occupations—food technology and turfgrass management. The Food Technology certificate program, conducted on the Berks Campus, is a course of formal classroom and laboratory instruction. Information on this program may be obtained by contacting Continuing Education, Penn State Berks, P.O. Box 7009, Reading, PA 19610-6009; 610-320-4874.

The GOLF COURSE TURFGRASS MANAGEMENT certificate program consists of two eight-week winter terms a year for two years. To gain practical experience, a six-month on-the-job internship is required between the first and second years. High school graduates 17 or older are eligible to apply. Admission to the program is limited and competitive. Offers to enroll are based on scholastic achievement, work experience, letters of recommendation, and the applicant's personal goals. Information on this program may be obtained by contacting the Department of Crop and Soil Sciences, 116 ASI Building, University Park, PA 16802; 814-865-6541.

The TURFGRASS AND AGRICULTURAL EQUIPMENT SERVICES (TAE) certificate program is a two-year certificate with four eight-week sessions. Sessions are offered at the University Park campus with the fall session running late October through December and the spring session January through early March. There is a

required internship between the first and second years of the program. Students enrolled in this program become service technicians in the agricultural, turfgrass, and related industries. They can apply the technical skills learned in the operation, repair and maintenance, and scheduling of equipment. Students in the TAE program study hydraulics and electrical, mechanical, and power transfer systems. They also learn to use comptuers for equipment scheduling, inventory, and maintenance records. The program is accredited by the Engine and Equipment Training Council. For information about this program, contact the Department of Agricultural and Biological Engineering, 249 Agricultural Engineering Building, University Park, PA 16802; or Dr. James W. Hilton, 232 Agricultural Engineering Building, University Park, PA 16802; jwh2@psu.edu; 814-863-1817; or visit: **www.abe.psu.edu**.

AGRICULTURAL CONFERENCES AND SHORT COURSES are held regularly on the University Park campus and around the state. The Office of Conferences and Short Courses works with Penn State faculty, government agencies, rural and urban organizations, and farm groups in planning and organizing these meetings. Using University-based resources, the conferences and short courses help businesses, industry, and individuals keep abreast of the latest developments that affect their lives and livelihoods. Conference announcements may be obtained from the Office of Conferences and Short Courses, The Pennsylvania State University, 306 Agricultural Administration Building, University Park, PA 16802-2601; 814-865-8301; fax, 814-865-7050.

AGRICULTURAL RESEARCH

The college, in association with its counterparts in other states and in federal agencies, supports research related to the production and use of food, fiber, and forestry products and to the economic and social well-being of those living in rural and urban areas. It has a primary role in providing research information for use by the Penn State Cooperative Extension and other public educational institutions.

Not only does the college fund research to increase the economic and technical efficiency with which products are produced and utilized, but it also is concerned with finding ways of achieving greater agricultural abundance in harmony with the environment and of achieving an ever-increasing level of quality in those products. While the events of recent years have made readily apparent the justification for emphasis on research centering on production of feed and other renewable resources, the human welfare aspects of life in rural and urban areas also have been given attention.

To a large extent the research leaders are also actively engaged in the resident education, short course, and extension programs. The interaction enriches the content of the instructional experience and also guides the research efforts toward the solution of broad social concerns.

PENN STATE COOPERATIVE EXTENSION

Cooperative extension is a nonformal, community-based educational resource of Penn State, funded cooperatively by state and county governments and the U.S. Department of Agriculture. For more than seventy-five years, Pennsylvanians have turned to Penn State Cooperative Extension for new ways to solve community and individual problems.

—Each year, more than 2 million people participate in Penn State Cooperative Extension seminars, workshops, conferences, short courses, computer-assisted learning, learn-at-home programs and other activities. Countless others request information and guidance from county agents and their staff, and many more receive extension-related information through newspapers, radio, television, publications, Web sites, and other media.

—About 300 county extension agents, 130 paraprofessionals, and 50,000 volunteers help plan, deliver, and evaluate cooperative extension education programs in all sixty-seven Pennsylvania counties. Teams of extension agents and Penn State faculty develop and provide leadership for educational programs and materials.

—Penn State Cooperative Extension 4-H youth programs reach about 120,000 young people between the ages of 8 and 19 through organized clubs, special or short-term programs, school enrichment activities, and individual study. About 11,000 adult and 1,600 teen volunteer leaders work with county 4-H extension agents to deliver these programs. Youth participants come from cities (22 percent), suburbs (11 percent), medium-sized towns (21 percent), small towns (40 percent), and farms (6 percent).

—Tapping Penn State's rich store of information, new research, and new thinking about issues relevant to citizens of the Commonwealth, Penn State Cooperative Extension offers a broad range of programs in areas vital to the quality of life in Pennsylvania, including agriculture; natural resources and environmental management; 4-H/youth development; community resources and economic development; family development and resource management; leadership and volunteer development; and nutrition, diet, and health.

SCHOOL OF FOREST RESOURCES

PROFESSOR CHARLES H. STRAUSS, Director

The School of Forest Resources provides professional education important to the proper management and utilization of renewable natural resources. These resources include forests, wildlife, and fisheries, managed to provide a variety of benefits to people, from the wood products that we use in construction, cabinets, furniture, and paper to the wild animals that we enjoy photographing and hunting. School programs emphasize conservation, which is the sustained use of resources to meet people's needs now and in the future.

ADMISSION—Admission requirements for the College of Agricultural Sciences are listed at the beginning

of this section. Students who expect to continue in the School of Forest Resources should be prepared to take a course in calculus.

UNDERGRADUATE STUDENT SERVICES AND COUNSELING—The coordinator of undergraduate student programs is responsible for undergraduate curricula, general student advising, assignment of advisees, special academic programs, and employment.

GRADUATE EDUCATION—Students interested in advanced degrees should consult the *Graduate Degree Programs Bulletin* and the *Graduate Student Manual.*

ALTOONA COLLEGE

WILLIAM G. CALE, Jr., *Campus Executive Officer and Dean*
KJELL MELING, *Associate Dean and Director of Academic Affairs*

INTRODUCTION

Penn State Altoona, located on 157 acres on the outskirts of Altoona, Pennsylvania, is just 45 miles from the University Park campus. Enrolling approximately 4,000 students, Penn State Altoona offers a unique residential undergraduate experience by combining a small-college atmosphere within the context of a major research university. Small classes taught by experienced professors in a friendly setting provide students with the opportunity to complete the following baccalaureate majors at Penn State Altoona: (four-year programs) Biology; Business; Communications; Criminal Justice; Electro-Mechanical Engineering Technology; Elementary and Kindergarten Education; English; Environmental Studies; Human Development and Family Studies; Integrative Arts; Letters, Arts, and Sciences; Mathematics; Nursing; Psychology; and Science. Penn State Altoona also offers associate degrees in: Business Administration; Criminal Justice; Electrical Engineering Technology; Human Development and Family Studies; Information Sciences and Technology; Mechanical Engineering Technology; Letters, Arts, and Sciences; Nursing; and Science. Penn State Altoona offers minors in Communications, Criminal Justice, Dance Studies, English, Entrepreneurship, Environmental Studies, Health Policy, History, Human Development and Family Studies, Mathematics, Natural Science, Political Science, Psychology, Spanish, and Women's Studies. Penn State Altoona also offers the first two years of course work for more than 160 Penn State majors, which can be completed at other Penn State locations.

GENERAL GRADUATION REQUIREMENTS

To graduate, a candidate must complete the course requirements for the candidate's major, earn at least a C (2.00) cumulative grade-point average for all courses taken at the University, and earn a grade of at least C in each major course designated by the major as a C-required course.

Note: See **www.psu.edu/bulletins/bluebook/gened/bad.html** for courses that meet University-wide bachelor of arts degree requirements.

COLLEGE ACADEMIC ORGANIZATION

DIVISION OF ARTS AND HUMANITIES

ASSOCIATE PROFESSOR KENNETH A. WOMACK, *Head*

The division offers a bachelor of arts degree program in Letters, Arts, and Sciences with self-designed curricula in one of six options: Arts; Humanities; Social and Behavioral Sciences; Science and Mathematics; Science, Technology, and Society; or Liberal Studies. The division also offers bachelor of arts degrees in Communications, English, Environmental Studies, and Integrative Arts. An associate degree in Letters, Arts, and Sciences is also available.

DIVISION OF BUSINESS AND ENGINEERING

ASSOCIATE PROFESSOR WILLIAM G. ENGELBRET, *Head*

The division focuses on outstanding teaching and learning, applied scholarship, and other needs of undergraduate students who will begin careers in business and industry after graduation. It provides all four years of the bachelor of science in Electro-Mechanical Engineering Technology (BSEMET) and the bachelor of science in Business (BSB). The division also provides the first two years of all bachelor of science degrees offered by the Smeal College of Business and the College of Engineering. Associate degrees in Business, Electrical Engineering Technology, Mechanical Engineering Technology, and Information Sciences and Technology are also available.

DIVISION OF EDUCATION, HUMAN DEVELOPMENT, AND SOCIAL SCIENCES

ASSOCIATE PROFESSOR VALERIE N. STRATTON, *Head*

The division offers associate degrees in Criminal Justice, Human Development and Family Studies, and Nursing. The division also offers bachelor degrees in Elementary and Kindergarten Education (Elementary Teaching option), Criminal Justice, Human Development and Family Studies, Nursing, and Psychology. There are nine disciplines in the division: Biobehavioral Health; Counselor Education; Criminal Justice; Education;

Human Development and Family Studies; Kinesiology; Nursing; Psychology; and Sociology.

DIVISION OF MATHEMATICS AND NATURAL SCIENCES
PROFESSOR NICHOLAS M. MISKOVSKY, *Head*
The division offers bachelor degrees in Biology, Environmental Studies, Mathematics, and Science. The division also offers the courses for the first two years of degree programs offered by the Eberly College of Science and the College of Earth and Mineral Sciences, and some degree programs offered by the College of Agricultural Sciences. An associate degree in Science is also available.

DIVISION OF UNDERGRADUATE STUDIES
JOANN M. SHAFFER, *Senior DUS Programs Coordinator*
The Division of Undergraduate Studies (DUS) at Penn State Altoona is an academic unit of enrollment for students who wish to explore the University's academic opportunities before deciding upon a field of study. DUS enrollment is also available to students who encounter changes in interests and career goals and wish to redefine their academic goals. In addition to offering a unit of enrollment, DUS also provides the following services: testing, counseling, and advising for all entering first-year students and their families; academic advising and educational planning for students and prospective students; and a University-wide academic advising and information network available to all Penn State students, faculty, and staff.

DIVISION OF STUDENT AFFAIRS—DAVID P. SHIELDS, Jr., *Director*
The Division of Student Affairs at Penn State Altoona provides students with the services, activities, and developmental opportunities that will supplement their academic experience and enhance the quality of their lives while enrolled at the college. Programs and services offered by the Division of Student Affairs will facilitate students' personal development, and enable them to become individuals of integrity, tolerance, and vision, committed to a life of service; capable of making sound ethical decisions; and prepared to function successfully as leaders within a diverse, multicultural, and international world.

INTERCOLLEGIATE ATHLETICS—FREDINA M. INGOLD, *Director of Athletics*
Emphasis is placed on opportunities for highly developed levels of skill and physical fitness through regular competition with athletes from other colleges. Men's varsity sports are baseball, basketball, golf, soccer, swimming, and tennis. Women's varsity sports are basketball, soccer, softball, swimming, tennis, and volleyball. Penn State Altoona is a member of the National Collegiate Athletic Association (NCAA), Division III in the Allegheny Mountain Collegiate Conference (AMCC). Regionally, Penn State Altoona is a member of the Eastern College Athletic Conference (ECAC).

COLLEGE OF ARTS AND ARCHITECTURE

RICHARD W. DURST, *Dean*
YVONNE M. GAUDELIUS, *Associate Dean for Undergraduate Studies and Outreach*
EDWARD V. WILLIAMS, *Associate Dean for Research and Graduate Studies*

COLLEGE ACADEMIC ORGANIZATION

School of Architecture and Landscape Architecture
  Department of Architecture — DANIEL E. WILLIS, Head
  Department of Landscape Architecture — BRIAN A. ORLAND, Head
Department of Art History — CRAIG R. ZABEL, Head
Department of Integrative Arts — WILLIAM J. KELLY, Head
School of Music — RICHARD D. GREEN, Director
School of Theatre — DAN H. CARTER, Director
School of Visual Arts — CHARLES R. GAROIAN, Director

UNIVERSITY ARTS SERVICES

RICHARD W. DURST, *Executive Director*
LEA ASBELL-SWANGER, *Interim Director, Center for the Performing Arts*
JAN KEENE MUHLERT, *Director, Palmer Museum of Art*

INTRODUCTION

The COLLEGE OF ARTS AND ARCHITECTURE has these primary educational objectives: (1) to provide high-quality professional instruction in the fields of architecture, art, art education, art history, landscape architecture, music, music education, and theatre arts, and to prepare teachers in those fields; (2) to provide an array of resident instructional opportunities in artistic and environmental areas for all students in the University; and (3) to provide ongoing opportunities for personal growth for the citizens of the Commonwealth through continuing education in all of those arts and professions and by direct involvement in fostering programs of performance, exhibitions, publication, design, planning, and audience development.

The college's mission is the enrichment of the cultural life as an integral part of society's essential needs

through enhancement of both the general living environment and the special cultural or aesthetic experiences of the citizens of the Commonwealth. To that end the college focuses upon (1) education, in its broadest sense, through creative expression and appreciation of the fine arts, performance, and design; (2) scholarly research and creative endeavors in the arts for the benefit of faculty and students, as well as for society at large. The college seeks effectiveness in pursuit of its mission through (1) a climate for excellent achievement, fostered by high standards for faculty, with concern that the excellence of their continuing scholarly professional and creative work be balanced with the excellence of their teaching; (2) core stability and strength by maintaining a balance of disciplines that reinforce each other and that approach completeness in the teaching and practice of the arts/architecture range of disciplines; (3) maintaining the scope of its offerings in a broad array of courses and programs and wide diversity of arts exposure and training, within limits imposed by considerations of feasibility, appropriateness, and a significant measure of societal need.

Students can prepare for a professional career in the following fields: (1) architecture, landscape architecture, (architect, landscape architect, planner); (2) art history (art historian, museum curator); (3) art, art education (painter, sculptor, designer, ceramist, printmaker, photographer, art educator); (4) music, music education (performer, composer, musicologist, music educator); (5) theatre (actor, director, designer, technician, dancer), or integrative arts (inter- and multidisciplinary studies).

To be eligible for entrance to a major in this college, a degree candidate must be enrolled in the college or satisfy requirements for entrance to the college. In addition, the degree candidate must meet entrance-to-major requirements of the University, of the college, and of the program area. Under certain circumstances, the University may need to limit enrollments in the college or in certain majors because of space limitations.

SCHOOL OF MUSIC

PROFESSOR RICHARD D. GREEN, *Director*

The School of Music offers one general and three professional programs leading to baccalaureate degrees in music. The general program (B.A.) provides a liberal arts education with music as the major subject. Two of the professional programs (B.S. and B.Mus.) emphasize the development of proficiency in the major area: music education, music history, composition, or performance, while the B.M.A. is an interdisciplinary program that is intended to prepare students for a career in performance as well as develop a secondary emphasis outside of music. Placement in any degree program is based partly on an audition, a placement examination, and an interview, all of which can be arranged with the director of the School of Music. Such examinations are advisory and designed to counsel the student.

Students in all programs take courses in theory, history, and their major instrument during their first four semesters. (These courses are available only at University Park campus.) All students attend a designated number of recitals and common hours. All B.Mus., B.M.A., and B.S. students take jury examinations each semester. All Music majors undergo a comprehensive second-year review of their eligibility to continue.

The School of Music provides opportunities for the general student to participate in a wide range of musical activities. Besides the performing ensembles, there are courses specifically designed for the general student in music appreciation, rudiments, jazz, and individual and group performance instruction.

SCHOOL OF THEATRE

PROFESSOR DAN H. CARTER, *Director*

The School of Theatre offers one general and one professional degree leading to baccalaureate degrees in theatre. The general program (B.A.) provides a liberal arts education with theatre as the major subject. The professional program (B.F.A.) emphasizes the development of proficiency in the major area: Muscial Theatre, Production, or Stage Management. Placement in any degree program is based partly on an audition/portfolio review and interview.

Students in all programs take courses in dramatic literature, theory, history, and their major area of emphasis as well as the full range of courses that the general education experience comprises.

The School of Theatre offers nonmajors THEA 100 The Art of the Theatre (a survey class in theatre appreciation), THEA 102 Fundamentals of Acting, and various special-interest courses such as THEA 208 Workshop: Theatre in Diverse Cultures, THEA 406 Theatre in Asia, THEA 407 Women and Theatre, and THEA 412 African American Theatre.

The School of Theatre also offers the M.F.A. degree in Acting, Directing, and Design.

SCHOOL OF VISUAL ARTS

PROFESSOR CHARLES GAROIAN, *Director*

The School of Visual Arts helps students prepare for careers as studio artists, graphic designers, or art educators through a combination of professional and liberal studies. The B.A. or B.F.A. degree can be earned in any of six studio areas of concentration: ceramics, drawing and painting, graphic design (B.A. only), photography, printmaking, or sculpture, and the B.S. can be earned in Graphic Design and Art Education. The B.A. degree combines a comprehensive liberal education with professional studies in the studio and graphic design areas. The B.F.A. is a professional degree that develops the competence necessary for a career in art or as preparation for graduate study in visual art. The B.S. in Art Education helps prepare art teachers for either elementary or

secondary schools, for educ—ional positions in museums, arts centers, health or custodial care centers, and similar institutions. Graduates of the Schools option of the Art Education program will have met all of the academic requirements for a teaching certificate in Pennsylvania and in about thirty other states as well.

Graduates of the B.A. or B.F.A. degree program are eligible to pursue graduate studies toward either the M.A. or M.F.A., and those who have earned the B.S. in Art Education are qualified to apply for admission to an M.Ed. or an M.A. (and eventually an Ed.D. or a Ph.D.) program in art education or in art therapy.

Admission consideration for any visual arts degree program requires a portfolio review. The purpose of the portfolio is to determine the talent potential of students who wish to pursue professional degrees in the visual arts.

CONTINUING AND DISTANCE EDUCATION

The Continuing and Distance Education program of the college has a wide variety of programs and activities available to the people within the Commonwealth and will plan special programs upon request.

FORMAL INSTRUCTION—Numerous undergraduate and graduate-level credit courses listed in the bulletin can be conducted throughout the state providing proper facilities and/or equipment are available.

INFORMAL INSTRUCTION—Noncredit courses, workshops, or other types of informal programs (lectures, demonstrations, conferences) are available or will be developed in most areas of the arts. Examples of these are workshops or courses in ceramics, photography, painting, and musical skills.

SPECIAL EVENTS—Concerts and recitals, jazz dance productions, and art exhibits can be scheduled in any appropriate facility. For example, groups of professional musicians are available to perform, as are student groups specializing in various styles of music from contemporary to classical.

CORRESPONDENCE COURSES—A limited number of home study courses in the arts are available. Requests for information on all continuing education activities within the college should be addressed to Continuing and Distance Education, College of Arts and Architecture, The Pennsylvania State University, 116 Arts Building, University Park, PA 16802-2900.

GENERAL GRADUATION REQUIREMENTS

In order to be certified for graduation a student must complete the general education requirements, the requirements of the major, and the number of elective credits required in each program. The minimum number of credits for each program is listed in the description of the major. In addition to the minimum number of credits required, each student must earn at least a grade of C in designated courses in the major field and must have earned a minimum grade-point average of 2.00.

NOTE: ROTC courses are voluntary; a maximum of 6 ROTC credits may be counted as electives in meeting graduation requirements.

BACHELOR OF ARTS DEGREE REQUIREMENTS

The majors that lead to the B.A. degree require a broad liberal education with an overall view of the arts plus a major program of studies in one of these five fields: art, integrative arts, art history, music, or theatre.

REQUIREMENTS FOR ALL STUDENTS—All students pursuing a Bachelor of Arts Degree program in the College of Arts and Architecture are required to satisfy 12–24 credits of B.A. requirements as listed below.

In addition, all students in the college must complete 6 credits of arts history. These credits may be counted as a part of the major or, if outside the major, may be counted under the bachelor of arts degree requirements.

COLLEGE BACHELOR OF ARTS DEGREE REQUIREMENTS: 12–24 credits
FOREIGN LANGUAGE (0–12 credits)
Proficiency in a single foreign language must be demonstrated by either examination or course work equivalent to completion of 12 credits of course work.
ARTS (3 credits)
HUMANITIES (3 credits)
SOCIAL AND BEHAVIORAL SCIENCES (3 credits)
OTHER CULTURES (3 credits)

Note: See **www.psu.edu/bulletins/bluebook/gened/bad.html** for courses that meet University-wide bachelor of arts degree requirements.

BERKS-LEHIGH VALLEY COLLEGE

SUSAN PHILLIPS SPEECE, *Dean and Campus Executive Officer*
CARL R. LOVITT, *Associate Dean of Academic Affairs*
ANN M. WILLIAMS, *Assistant Dean; Campus Executive Officer for Lehigh Valley campus*

COLLEGE ACADEMIC ORGANIZATION

DIVISIONS

Engineering, Business, and Computing
Humanities, Arts, and Social Sciences
Science

INTRODUCTION

Penn State Berks-Lehigh Valley College, with campuses in suburban Reading and Fogelsville, offers high-quality, diverse programs. Students may choose from the two- and four-year programs offered at the college's locations or take the first two years of more than 160 Penn State academic programs that can be completed at other Penn State locations.

Associate degree programs: Agricultural Business; Business Administration; Electrical Engineering Technology; Hotel, Restaurant, and Institutional Management; Information Sciences and Technology; Letters, Arts, and Sciences; Mechanical Engineering Technology; Occupational Therapy

Baccalaureate degree programs: American Studies; Applied Psychology; Business; Electro-Mechanical Engineering Technology; Global Studies; Information Sciences and Technology; Kinesiology, Wellness Development Specialization option; Professional Writing; Science

For the most current list of programs available, including minors, click on the link for Majors and Minors in this college's menu in the online bulletin: **www.psu.edu/bulletins/bluebook.**
See **www.psu.edu/bulletins/bluebook/gened/bad.html** for courses that meet University-wide bachelor of arts degree requirements.

THE MARY JEAN AND FRANK P. SMEAL COLLEGE OF BUSINESS ADMINISTRATION

JUDY D. OLIAN, *Dean*
EDWARD T. REUTZEL, *Senior Associate Dean*
DAVID P. CHRISTY, *Associate Dean for Undergraduate Programs*
RUSSELL R. BARTON, *Associate Dean for Research and Director of Ph.D/M.S. Programs*
PATRICK A. CATALDO, *Associate Dean for Executive Education*
JOHN M. STEVENS, *Smeal Director of Outreach and Cooperative Extension*

COLLEGE ACADEMIC ORGANIZATION

Accounting — DAN GIVOLY, *Chair*
Finance — WILLIAM A. KRACAW, *Chair*
Insurance and Real Estate — KENNETH M. LUSHT, *Chair*
Management and Organization — CHARLES SNOW, *Chair*
Marketing — MARVIN E. GOLDBERG, *Chair*
Supply Chain and Information Systems — JOHN E. TYWORTH, *Chair*

INTRODUCTION

The Mary Jean and Frank P. Smeal College of Business Administration is a preeminent learning community, known for shaping business practice for tomorrow's converging economies. Smeal College's seven academic departments, as well as its research centers and institutes, present programs and studies in leading-edge areas such as B2B marketing, supply chain management, e-business, and entrepreneurship along with the traditional areas of marketing, management, finance, real estate, accounting, and information systems.

The late Mary Jean Smeal and Frank P. Smeal both graduated from Penn State in 1942, she with a degree in arts and letters and he with one in economics. The Smeals have been generous supporters of the University for more than thirty years and have consistently supported excellence in education throughout their lives. Their generous $10 million gift to the college in 1990 provided a foundation of excellence for students and faculty, and The Mary Jean and Frank P. Smeal College of Business Administration is named in their honor.

RESIDENT EDUCATION—Through our innovative curriculum, students are prepared for the various fields in business administration. The curriculum offers a liberalized education, an integrated core, an international outlook, and is issues-oriented. Students are required to complete a minimum of 135 credits for the Actuarial Science major, and a minimum of 128 credits for all other majors. The undergraduate program leads either to a career in the operation or management of economic or social institutions.

DEGREES—The college offers the B.S. degree, as well as graduate work leading to the M.B.A., the M.S., and the Ph.D. degrees, with a major in Business Administration. General requirements for these graduate degrees are described in the *Graduate Degree Programs Bulletin* and the *Manual for Graduate Students*. The master of manufacturing management degree program is offered jointly with the College of Engineering.

Students who want to major in Economics are offered several alternatives: (1) They may qualify for a B.S. degree with a business administration emphasis by enrolling in the major in the Smeal College of Business. (2) They may qualify for a B.S. degree, with specific technical skills courses emphasized, by matriculating in the College of the Liberal Arts and conforming to the requirements of that college. (3) They may qualify for a B.A. degree by matriculating in the College of the Liberal Arts and conforming to all graduation requirements of that college. In all cases, all economics courses would be taken in the College of the Liberal Arts. The Smeal College also cooperates with the Colleges of Agricultural Sciences, and Earth and Mineral Sciences in selected degree programs offered by those colleges.

By careful planning, students may choose to meet University Faculty Senate requirements for earning a simultaneous or multiple degrees with a Smeal College major and a major in another college. Students completing one degree in Smeal College are not permitted to complete a second degree (simultaneous, multiple major, or sequential) in Smeal College.

MINORS—The Smeal College and the College of the Liberal Arts offer an interdisciplinary minor in Business/Liberal Arts for students outside Smeal College of Business. Students who complete the course requirements for the minor will have this fact recorded on the transcript. Students interested in the minor should refer to "Business/Liberal Arts Minor" in the Minors section of this bulletin.

The college offers minors in selected areas as resources permit, and they are open to all University Park students. The Smeal College currently has minors available in Business Logistics; Global Business Strategies for the Earth, Energy, and Materials Industries; Insurance; International Business; Legal Environment of Business, Management Information Systems, Operations Management; Real Estate; Supply Chain and Information Sciences and Technology. Details are available in the Minors section of the academic program section of this bulletin.

RESEARCH, EXECUTIVE, AND OUTREACH AND COOPERATIVE EXTENSION—Smeal College of Business is a research leader among American business schools. Last year, more than $5.6 million was received to carry out studies that not only advanced the science of business, but enriched the classroom as well. Smeal College research develops new and improved solutions to significant managerial problems and helps ensure that what students learn in the classroom is on the cutting edge.

Penn State Executive Programs offers intensive professional development experiences for business and government leaders around the world. Open-enrollment programs benefit executives from diverse industries and cultures seeking to master competencies for leadership excellence. Custom programs are uniquely designed to help individual organizations enhance competitiveness and lead through cycles of change. In recognizing the needs of busy executives for flexible alternatives in development, Penn State Executive Programs offers specially designed executive degree programs, one- to two-day "Hot Topic" workshops, and one-of-a-kind programs for corporate vertical consortia and corporate board development.

The continuing and distance education programs of Smeal College are designed to provide continuing development of skills and knowledge for adults throughout the Commonwealth. These programs offer clients in the private, nonprofit, and public sectors new knowledge on business-related topics to develop and reinforce effective management.

DIVISION OF RESEARCH

RUSSELL R. BARTON, *Associate Dean for Research*

The Division of Research administers programs to support faculty research, and houses the following research units: Center for Global Business Studies; Center for Supply Chain Research; Center for the Management of Technological and Organizational Change; the Risk Management Research Center; Center for Research in Conflict and Negotiation; Center for the Study of Business and Public Issues; Institute for Real Estate Studies; Institute for the Study of Business Markets; eBusiness Research Center; Garber Venture Capital Center; and The Farrell Center for Entrepreneurship.

PENN STATE EXECUTIVE PROGRAMS

PATRICK A. CATALDO, *Associate Dean for Executive Education*

Executive Programs broke significant ground in the field of executive and organizational development when it was founded in 1954. Today, Smeal ranks among the top twenty-five providers worldwide and is among the top twelve in the United States. Renowned faculty are assembled from the college, other leading schools, and noted industry experts to provide the most current methodologies and research as well as world-class experience in business management practices. Each year more than 1,000 middle- and senior-level managers from some of the world's largest corporations participate in custom and open-enrollment programs to gain new business acumen, broaden their perspectives, and develop leadership competencies. Program areas of specialization include general management, supply chain, finance, and business-to-business marketing. For more information about all

development opportunities available through Penn State Executive Programs, please visit: **www.smeal.psu.edu/psep** on the Web.

CONTINUING AND DISTANCE EDUCATION

JOHN M. STEVENS, *Smeal Director of Outreach and Cooperative Extension*

The Smeal College's mission is to provide professional education in a variety of business-related subjects for men and women. Since 1915, the University has offered management development services for business, industry, nonprofit, and public institutions throughout the Commonwealth. The programs are designed to update management theory and practices, develop and reinforce effective managerial skills and attitudes, and provide an opportunity for career development and lifelong learning.

Professional development programs are offered in real estate, insurance, general management, marketing, accounting, finance, business law, business logistics, and many other fields. Among the more than 1,400 programs providing these learning experiences are credit and noncredit certificates, informal seminars, workshops, conferences, associate and baccalaureate degree courses, distance education, and independent learning by correspondence. Annually, more than 20,000 people participate in Smeal College continuing and distance education programs throughout the Commonwealth.

CREDIT SCHEDULING RECOMMENDATION

The suggested minimum schedule for first-year students is 16 credits per semester, 32 credits per year. The maximum credit load in any semester is 19, unless permission is obtained from the office of the associate dean for undergraduate programs.

Smeal College does not accept credits with pass/fail grades. Students enrolled in Smeal College must enroll in all courses for a letter grade and may never enroll in courses for pass/fail grades.

Smeal College of Business courses numbered 150 through 199 may not be used to satisfy college or departmental baccalaureate degree requirements. Other courses not acceptable for meeting the requirements of the B.S. degree are B LOG 301, FIN 100, FIN 108, FIN 301, MGMT 100, MGMT 301, MKTG 221, MKTG 301, OPMGT 301, and R EST 100.

FOREIGN LANGUAGE REQUIREMENT—Effective in summer 1998 and thereafter, all first-year students intending to enter Penn State's Smeal College of Business will be required to attain level-three proficiency in one language other than English as a condition of graduation. The criteria for placement in a foreign language are outlined in the "Placement Policy for Penn State Foreign Language Courses." This and all other foreign language policies are located in the General Information section of this bulletin.

ADMISSION TO A MAJOR

Under certain circumstances, the University may need to limit enrollments in certain majors because of space limitations. Information about majors that may have enrollment controls is available in the office of the Associate Dean for Undergraduate Programs, 104 Beam Business Administration Building, University Park, PA 16802-1911; 814-863-1947; or on Web at **www.smeal.psu.edu**.

To be eligible for entrance to a major in this college, a degree candidate must be enrolled in Smeal College or the Division of Undergraduate Studies and satisfy requirements for entrance to the college. In addition, the degree candidate must meet the following requirements:

1. The degree candidate must be taking, or have taken, a program appropriate for entry to that specific major, as shown in this bulletin, including approximately 60 credits of course work.
2. To be eligible for consideration for entrance into Business Administration majors, a student must have a competitive cumulative grade-point average and must have completed the following requirements: ACCTG 211; B A 243; ECON 002 GS, ECON 004 GS; M I S 204; MSIS 200; ENGL 015 GWS or ENGL 030 GWS; MATH 110 GQ or MATH 140 GQ; and CMPSC 203 GQ. Students must have completed an approved first-year seminar. Additional information about applying for these majors is available in the office of the associate dean for undergraduate programs of Smeal College.

BACCALAUREATE DEGREE REQUIREMENTS AND COLLEGE REQUIREMENTS—Smeal College courses numbered 150 through 199 may be taken for credit, but such credits may not be used to satisfy college or departmental degree requirements. Other courses not acceptable for meeting the requirements of the B.S. degree are B LOG 301, FIN 100, FIN 108, FIN 301, MGMT 100, MGMT 301, MKTG 221, MKTG 301, OPMGT 301, and R EST 100.

CAPITAL COLLEGE

MADLYN L. HANES, *Provost and Dean*
WILLIAM J. MAHAR, *Associate Provost/Senior Associate Dean*
PATTI A. MILLS, *Assistant Dean for Academic Affairs/Interim Assistant Dean for Graduate Studies*

COLLEGE ACADEMIC ORGANIZATION

School of Behavioral Sciences and Education — ERNEST K. DISHNER, *Interim Director*
School of Business Administration — MUKUND S. KULKARNI, *Director*
School of Humanities — KATHRYN ROBINSON, *Director*
School of Public Affairs — STEVEN A. PETERSON, *Director*
School of Science, Engineering, and Technology — OMID ANSARY, *Director*

PENN STATE HARRISBURG

Penn State Harrisburg is an undergraduate college and graduate school of the University. The Harrisburg campus enrolls about 1,700 undergraduate and 1,700 graduate students and offers two associate, 27 baccalaureate, 20 master's, and two doctoral degree programs as well as certificate and certification programs.

Penn State Harrisburg is located on a suburban campus in Middletown, Pennsylvania, eight miles east of Harrisburg. The campus is easily accessible via major interstate routes and the Pennsylvania Turnpike's Exit 247. Harrisburg International Airport is within one mile of the campus, public transportation serves the college, and rail service affords convenient access from locations throughout the nation.

Beginning with the fall 2004 semester, Penn State Harrisburg will offer all four years of study in twenty-six of its baccalaureate programs as well as the first two years of study leading to more than 160 baccalaureate majors offered throughout the Penn State system.

Penn State Harrisburg began offering all four years of study in Information Sciences and Technology in fall 2001 and in Computer Science, Electrical Engineering, Environmental Engineering, Mathematical Sciences, and Structural Design and Construction Engineering Technology in fall 2003.

At the transfer level, the college serves students from all campuses of Penn State and students from community colleges and other accredited colleges and universities. Penn State students are encouraged to choose the Capital College Common Year Major as their curriculum prior to attending Capital College.

The college has an extensive selection of graduate programs. Applications are welcomed from students who have completed a baccalaureate degree from a regionally accredited college or university or from international students. The graduate programs are designed for the part-time student who can participate in an evening program.

A full range of services and cultural programming is offered for both resident and commuter students and the campus is equipped to provide educational opportunities to the disabled. Construction of new housing on campus was completed in August 2002. A spacious, state-of-the-art library opened on the campus in January 2000.

Because specific requirements of particular programs vary, students should contact the Office of Enrollment Services, Penn State Harrisburg, 777 W. Harrisburg Pike, Middletown, PA 17057; 717-948-6250, or by e-mail at hbgadmit@psu.edu. Additional information regarding Penn State Harrisburg can be obtained through the campus Web site at **www.hbg.psu.edu**.

Note: Concerning undergraduate programs, see **www.psu.edu/bulletins/bluebook/gened/bad.html** for courses that meet University-wide bachelor of arts degree requirements.

PENN STATE SCHUYLKILL

SYLVESTER KOHUT, Jr., *Campus Executive Officer*

Founded in 1934, Penn State Schuylkill has traditionally offered the first two years of baccalaureate study, including both baccalaureate and associate degrees. The Schuylkill campus offers programs leading to six associate, four baccalaureate, and one master's degree. The campus also delivers the first two years of study leading to most of the University's more than 160 baccalaureate degree programs.

Located in Schuylkill Haven and with an enrollment in excess of 1,000, Penn State Schuylkill encompasses 70 acres and several major buildings—a classroom building, administration building, four apartment units, student/community center, multipurpose building, and a library, as well as a computer center, auditorium, and science and engineering laboratories.

Extracurricular activities include twenty clubs and student organizations, intercollegiate athletics, and intramural sports.

For further information about enrollment and programs of study, contact Admissions at 570-385-6252 or access information through the Penn State Schuylkill home page at **www.sl.psu.edu** on the Web.

COMMONWEALTH COLLEGE

DIANE M. DISNEY, *Dean*
SANDRA E. GLEASON, *Associate Dean for Faculty and Research*
NANCY L. HERRON, *Associate Dean for Academic Programs*
LINDA C. HIGGINSON, *Associate Dean for Students and Academic Support*

COLLEGE ACADEMIC ORGANIZATION

DIVISION HEADS

Arts and Humanities — PRISCILLA CLEMENT
Business and Economics — ORSAY KUCUKEMIROGLU
Engineering — DHUSHY SATHIANATHAN
English — RICHARD KOPLEY
Health and Human Development — CYNTHIA LIGHTFOOT
Information Sciences and Technology — RICHARD DEMPSEY
Mathematics — JAVIER GOMEZ-CALDERON
Science — CHRIS MARICONDI
Social Science and Education — VERONICA MONTECINOS

INTRODUCTION

The Commonwealth College, created to serve the educational needs of Pennsylvania communities, offers associate and baccalaureate degrees at twelve campus locations: Penn State Beaver; Penn State Delaware County; Penn State DuBois; Penn State Fayette, The Eberly Campus; Penn State Hazleton; Penn State McKeesport; Penn State Mont Alto; Penn State New Kensington; Penn State Shenango; Penn State Wilkes-Barre; Penn State Worthington Scranton; and Penn State York. University-owned residence halls are available at four locations: Beaver, Hazleton, McKeesport, and Mont Alto.

The college offers many students an opportunity to complete a Penn State degree close to home. The college prides itself on small class size, a low student-to-faculty ratio, strong emphasis on active and collaborative learning, undergraduate research, and faculty involvement in students' growth and development.

Commonwealth College students can earn a bachelor of arts or bachelor of science degree; they can earn associate degrees in selected two-year programs; or they can complete up to two years of most baccalaureate programs available within the University and then move on to either the University Park campus or other locations. Note: See **www.psu.edu/bulletins/bluebook/gened/bad.html** for courses that meet University-wide bachelor of arts degree requirements.

At selected locations, the Commonwealth College offers baccalaureate degrees. These programs have strong connections to the workplace, including internships and community research projects. For a complete list of academic programs offered, including associate degrees and minors, click on the Majors and Minors link in this college's menu.

For information about the administration of the twelve campuses of the Commonwealth College, see the University Administration list in this bulletin or online at: **www.psu.edu/bulletins/bluebook**.

For further information about the Commonwealth College, contact the college office at the University Park campus, 814-863-0327, or write to Commonwealth College, 111 Old Main, The Pennsylvania State University, University Park, PA 16802-1501. You may also visit the college's home page at **http://cwchome.psu.edu**.

COLLEGE OF COMMUNICATIONS

DOUGLAS A. ANDERSON, *Dean*
JOHN S. NICHOLS, *Associate Dean for Graduate Studies and Research*
PATRICK R. PARSONS, *Interim Associate Dean for Undergraduate Education*

COLLEGE ACADEMIC ORGANIZATION

Advertising/Public Relations — ROBERT A. BAUKUS, *Head*
Film and Video — DENNIS K. DAVIS, *Head*
Journalism — J. FORD RISLEY, *Head*
Media Studies — DENNIS K. DAVIS, *Head*
Telecommunications — PATRICK R. PARSONS, *Head*

CAREER PLACEMENT AND INTERNSHIPS

ROBERT P. MARTIN, *Director*

CONTINUING AND DISTANCE EDUCATION

ANNE M. HOAG, *Director*

HONORS PROGRAM

SUSAN STROHM, *Director*

INTERNATIONAL PROGRAMS

DENNIS DAVIS, *Director*

MULTICULTURAL AFFAIRS

JOSEPH M. SELDEN, *Assistant Dean*

ACADEMIC SERVICES

PATRICK R. PARSONS, *Interim Associate Dean for Undergraduate Education*
JOSEPH M. SELDEN, *Assistant Dean for Multicultural Affairs*
MARION SCHWARTZ, *Coordinator, Division of Undergraduate Studies*

INTRODUCTION

The SCHOOL OF COMMUNICATIONS, approved by the Board of Trustees on May 18, 1985, became the COLLEGE OF COMMUNICATIONS in 1995. The College of Communications recognizes its mission to educate students for citizenship in a society in which communication and information are major commodities and the bases of the democratic process; acknowledges the complex mosaic of changing employment possibilities available in the information environment and thus prepares students for an employment climate in which the ability to adapt is a fundamental requisite to success; and facilitates the development of sophisticated abilities in the gathering, analysis, and dissemination of information.

The college offers a strong liberal arts education plus rigorous professional preparation to those planning careers in the mass media. The college also offers courses analyzing the role of the mass media in modern society.

For more information about the College of Communications, please write to Academic Services, College of Communications, The Pennsylvania State University, 204 Carnegie Building, University Park, PA 16802-5101.

ENTRANCE REQUIREMENTS

The provost of the University has approved administrative enrollment controls for admission to the Advertising/Public Relations and the Film and Video majors. Administrative controls specify the number of juniors to be admitted annually. Applications are approved based on a student's cumulative grade-point average after the third semester and the completion of specific course entrance requirements by the end of the fourth semester. Students applying to Advertising/Public Relations must have a grade of C or higher in English 015 GWS or 030 GWS and Economics 002 GS. For Film and Video, a grade of C or higher is required in COMM 150 and a grade of B or higher is required in COMM 242.

GRADUATION REQUIREMENTS

It is strongly recommended that a student schedule all courses under the guidance of his or her adviser and by using a computer-generated audit.

The minimum total credit requirement may not be met with duplicate credits (courses passed more than once), ENGL 004 and ENGL 005, MATH 001, MATH 002, MATH 003, MATH 004, and SPCOM 004.

No course offered by the College of Communications may be used by College of Communications students to satisfy the General Education or Bachelor of Arts requirements. The policy does not apply to COMM courses that are required as a part of a minor outside the College of Communications.

Students must select at least 80 credits in non-communications courses including at least 65 credits in the liberal arts and sciences.

Only courses in which a student earns a grade of C or better may be counted toward fulfilling requirements in the major. A student who receives two grades below C in courses in the major may be dropped from that major no later than the beginning of the student's seventh semester.

Courses in which a student earns a grade of D may be used to satisfy the General Education or B.A. requirement.

FOREIGN LANGUAGE—Students are advised to initiate their foreign language study upon entrance to the University but no later than the fifth semester.

BACHELOR OF ARTS DEGREE REQUIREMENTS

COLLEGE OF COMMUNICATIONS

BACHELOR OF ARTS DEGREE REQUIREMENTS: 12-24 credits

FOREIGN LANGUAGES (0-12 credits)

Proficiency in a single foreign language must be demonstrated by either examination or course work equivalent to completion of 12 credits of course work.

ARTS (3 credits)

HUMANITIES (3 credits)

SOCIAL AND BEHAVIORAL SCIENCES (3 credits)

OTHER CULTURES (3 credits)

Note: See **www.psu.edu/bulletins/bluebook/gened/bad.html** for courses that meet University-wide bachelor of arts degree requirements.

COLLEGE OF EARTH AND MINERAL SCIENCES

ERIC J. BARRON, *Dean*
ROBERT G. CRANE, *Associate Dean for Education*
ALAN W. SCARONI, *Associate Dean for Research*

COLLEGE ACADEMIC ORGANIZATION

Energy and Geo-Environmental Engineering
SEMIH ESER, *Acting Department Head*
PHILLIP HALLECK, *Acting Associate Head for Undergraduate Programs*

Geography
ROGER M. DOWNS, *Department Head*

Geosciences
TIMOTHY J. BRALOWER, *Department Head*
TANYA FURMAN, *Associate Head for Undergraduate Programs*

Materials Science and Engineering
GARY L. MESSING, *Department Head*
JOHN R. HELLMANN, Jr., *Undergraduate Programs Coordinator*

Meteorology
WILLIAM H. BRUNE, *Department Head*
HAMPTON N. SHIRER, *Associate Head for Undergraduate Programs*

INTRODUCTION

In the COLLEGE OF EARTH AND MINERAL SCIENCES, instruction and research are aimed at increasing our understanding of the Earth and human interactions with the environment; the production and utilization of fuels and mineral resources; and the science and technology of engineered materials. Programs dealing directly with the Earth and environment include Geosciences, Meteorology, Geography, and Earth Sciences. They also include Energy, Environmental, and Mineral Economics as well as Environmental Systems Engineering, which focuses on technologies for environmental clean-up and preservation. The production and utilization of energy and natural resources are the focus of Mining Engineering, Industrial Health and Safety, Petroleum and Natural Gas Engineering, and Mineral Economics, while areas dealing with engineering materials include the options offered by the Department of Materials Science and Engineering: Ceramic Science and Engineering, Electronic and Photonic Materials, Metals Science and Engineering, and Polymer Science and Engineering. These subjects also seek to advance the science and technology of composite materials.

Study in the College of Earth and Mineral Sciences thus covers an unusually wide range, from practical industrial problems, fundamental science, and advanced technology to global environmental issues, and human responses to changing social conditions. Degrees are offered in science, engineering, and social science.

All baccalaureate engineering programs in the College of Earth and Mineral Sciences are accredited by the Engineering Accreditation Commission of the Acceditation Board for Engineering and Technology: ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202-4012; telephone 410-347-7700; www.abet.org. In each of the engineering disciplines, as designated by the majors, students acquire knowledge of mathematics and the sciences basic to engineering and computer science, and the ability to solve problems through experimentation and analysis. Students develop and exercise intitiative, judgment, and creativity through the professional component and design experiences that are integrated across their baccalaureate study, culminating in a capstone design experience in the senior year. Emphasis is placed on application of the engineering method, the capability for critical thinking, teamwork, and the ability to communicate clearly, both orally and through written composition.

UNDERGRADUATE PROGRAMS

PROFESSOR ROBERT G. CRANE, *Associate Dean for Education*

The undergraduate programs of the college provide students with a personal and individual educational experience that helps prepare them for a variety of professional careers. They gain a fundamental understanding of their chosen area, acquire the basic skills and attitudes required to become members of their profession, and have opportunities to meet professionals in their field. Students are challenged to maximize their abilities and prepare for a future in which they will welcome continuous learning and professional growth. Communication skills are emphasized and strong support is provided by the college through a full-time professional writing

tutor. Research and scholarship are encouraged through participation in capstone design courses, undergraduate theses, or research projects. Field work experience is emphasized in several of the earth science-related majors.

CONCURRENT MAJOR AND COOPERATIVE PROGRAMS IN LIBERAL ARTS AND EARTH AND MINERAL SCIENCES—For a student who wishes to earn a liberal arts degree combined with technical preparation for a career in the earth, mineral, or materials sciences, the college offers two five-year options. The concurrent major program requires ten semesters of study, the first six in the College of the Liberal Arts and the last four in the College of Earth and Mineral Sciences. Upon completion of the program, a B.A. is awarded by the College of the Liberal Arts and a B.S. by the College of Earth and Mineral Sciences. The latter degree may be earned in any of the college's science or engineering programs.

In the cooperative liberal education program, the student completes three academic years of study in one of the EMS engineering programs at one of several cooperating liberal arts colleges and then transfers to Penn State for two additional academic years (four semesters). Upon completion of the program, the student is awarded the B.A. degree by the liberal arts college and the B.S. degree by the University. Arrangements for the cooperative program are in effect with several colleges in the state. Inquiries concerning admission should be made at the Earth and Mineral Sciences Student Center in 25 Deike Building, University Park campus.

TEACHER CERTIFICATION PROGRAMS—It is possible, with careful planning, for students to satisfy requirements for the provisional certificate for teaching in the Commonwealth of Pennsylvania while also satisfying requirements for the bachelor's degree in any major in the College of Earth and Mineral Sciences. Students who want to prepare for teaching certification should consult the certification officer of the College of Education or the Office of the Associate Dean for Education.

BASIC MINIMUM REQUIREMENTS FOR GRADUATION

The following general requirements have been established for all students admitted after spring 1999 who are candidates for a baccalaureate degree from the College of Earth and Mineral Sciences. The specific requirements of the several majors are in addition to these.

1. WRITING AND SPEAKING: 9 credits—EM SC 100S, ENGL 015, ENGL 202C or SPCOM 100. All EMS majors who begin as first-year students at the University Park campus are required to take EM SC 100S (GWS--3 credits) in their first fall semester. This course satisfies 3 credits of Writing and Speaking skills for General Education as well as the University requirement for first-year seminar.
2. QUANTIFICATION: 6 credits
3. KNOWLEDGE DOMAINS: 30 credits, to include Health and Physical Activitiy, 3 credits; Natural Sciences, 9 credits; Arts, 6 credits; Humanities, 6 credits; Social and Behavioral Sciences, 6 credits.

The following courses may be taken for credit, but such credits may not be used to satisfy college or departmental degree requirements: CHEM 001 GN, CHEM 002 GN, CHEM 011; MATH 001, MATH 002, MATH 004, MATH 021 GQ, MATH 022 GQ, MATH 026 GQ, MATH 040 GQ, MATH 041 GQ; PHYS 001 GN, PHYS 150 GN, PHYS 151; PH SC 007. Exception: The Department of Geography accepts MATH 021 GQ, MATH 022 GQ, MATH 026 GQ, MATH 040 GQ, and MATH 041 GQ as credits to satisfy departmental degree requirements.

Note: See **www.psu.edu/bulletins/bluebook/gened/bad.html** for courses that meet University-wide bachelor of arts degree requirements.

RESEARCH

PROFESSOR ALAN W. SCARONI, *Associate Dean for Research*

Research centered in the College of Earth and Mineral Sciences has three objectives: (1) graduate student training, (2) stimulation of the professional growth of the faculty, and (3) discharge of a responsibility to the Commonwealth of Pennsylvania and to the nation to seek solutions to problems arising predominantly out of the mineral and energy sectors of the economy and the physical environment.

Approximately 500 graduate students are engaged in research studies in the earth, materials, meteorological, and mineral sciences under the guidance of the faculty. Most members of the faculty are active in research, thereby strengthening both the undergraduate and the graduate programs of instruction.

CONTINUING AND DISTANCE EDUCATION

The activities in continuing and distance education include class and correspondence instruction in credit and noncredit courses and informal instruction.

CLASS INSTRUCTION—Instruction in the earth and mineral sciences is offered upon request, provided suitable facilities and teachers are available. Some courses carry college credit and are open only to qualified students; other courses are noncredit and are designed for adults interested in vocational or cultural self-improvement.

CORRESPONDENCE INSTRUCTION—College-credit courses are offered by staff members of appropriate departments.

INFORMAL INSTRUCTION—These programs are designed to fit the needs of individuals and groups interested in some special phase of adult education, new developments in the field, or professional and industrial applications of new scientific discoveries. Tailored specifically to the needs and interests of the groups to be served, the programs are developed in conjunction with the groups themselves.

COLLEGE OF EDUCATION

DAVID H. MONK, *Dean*
ROBERT M. HENDRICKSON, *Associate Dean, Graduate Studies, Research, and Faculty Development*
PATRICIA A. NELSON, *Associate Dean, Outreach, Cooperative Extension, Technology, and International Programs*
HORST VON DORPOWSKI, *Assistant Dean, Undergraduate and Summer Programs*

COLLEGE ACADEMIC ORGANIZATION

LEARNING AND PERFORMANCE SYSTEMS—*Department head to be announced*
Adult Education—IAN E. BAPTISTE, *In Charge*
Instructional Systems—ALISON A. CARR-CHELLMAN, *In Charge*
Workforce Education and Development—WILLIAM J. ROTHWELL, *In Charge*

COUNSELOR EDUCATION, COUNSELING PSYCHOLOGY, AND REHABILITATION SERVICES—ROBERT B. SLANEY, *Department Head*
College Student Affairs—ROBERT D. REASON, *In Charge*
Counseling Psychology—JEFFREY A. HAYES, *In Charge and Training Director*
Counselor Education—SPENCER G. NILES, *In Charge*
Rehabilitation Services—KEITH B. WILSON, *In Charge*

CURRICULUM AND INSTRUCTION—MURRY R. NELSON, *Department Head*
Curriculum and Supervision—NONA A. PRESTINE, *In Charge*
Elementary, Kindergarten, and Early Childhood Education—JACQUELINE EDMONDSON, *In Charge*
Graduate Programs—PATRICK W. SHANNON, *Coordinator*
Language and Literacy Education—PATRICK W. SHANNON, *In Charge*
Mathematics Education—M. KATHLEEN HEID, *In Charge*
Science Education—CARLA M. ZEMBAL-SAUL, *In Charge*
Secondary Education—MURRY R. NELSON, *In Charge*
Social Studies Education—MURRY R. NELSON, *In Charge*

EDUCATION POLICY STUDIES—JACQUELINE A. STEFKOVICH, *Department Head*
Comparative and International Education—PATRICIA A. NELSON, *In Charge*
Educational Administration—NONA A. PRESTINE, *In Charge*
Educational Theory and Policy—SUET-LING PONG, *In Charge*
Higher Education—ROGER L. GEIGER, *In Charge*

EDUCATIONAL AND SCHOOL PSYCHOLOGY AND SPECIAL EDUCATION—ROBERT J. STEVENS, *Department Head*
Educational Psychology—ROBERT J. STEVENS, *In Charge*
School Psychology—MARLEY W. WATKINS, *In Charge*
Special Education—KATHLEEN McKINNON, *Coordinator of Teacher Education*; DAVID McNAUGHTON, *In Charge*

Visit our Web site at: **www.ed.psu.edu**

INTRODUCTION

The COLLEGE OF EDUCATION is the professional school established to conduct and coordinate programs for the preparation of teachers and other educational personnel. Membership is held in the American Association of Colleges for Teacher Education and in the Pennsylvania Association of Colleges and Teacher Educators. The college is accredited by the National Council for Accreditation of Teacher Education for the preparation of elementary teachers, secondary teachers, and school service personnel, with programs ranging through the doctoral level. (See also Teacher Education Programs.)

RESIDENT INSTRUCTION—All undergraduate majors offer specialization in various professional fields and meet the University's requirements for the Bachelor of Science degree. Students completing the college's teacher certification requirements are eligible for an Instructional I teacher certificate issued by the Pennsylvania Department of Education. In addition to a wide range of teacher preparation programs, the college offers undergraduate noncertification programs. Beyond the undergraduate curricula, each of the college's academic units emphasizes advanced, graduate-level studies in education, which lead to master's and doctoral degrees. (See also the Penn State *Graduate Degree Programs Bulletin*.)

RESEARCH—Research and development are principal responsibilities of the college, informing and enriching

its other missions. Faculty and advanced students pursue new knowledge and educational development along with other scholarly and creative activities. Individuals and teams develop programmatic research contributing to knowledge in the many disciplines within the college. Faculty engage in sponsored research funded by federal agencies, the Commonwealth of Pennsylvania, regional and local school districts, foundations, and the corporate sector.

CONTINUING EDUCATION AND DISTANCE EDUCATION—The college extends its instructional services to professional school personnel at many locations in Pennsylvania through organized credit and noncredit courses, workshops, conferences, studies, and other forms of professional association. Short courses, institutes, workshops, and other programs also are conducted on the University Park campus during the entire year. Requests for information on items of special interest should be addressed to Continuing Education and Distance Education, College of Education, The Pennsylvania State University, 277 Chambers Building, University Park, PA 16802-3206.

Selected courses in education are also available via correspondence study. A descriptive bulletin may be obtained from the Department of Independent Learning, The Pennsylvania State University, 128 Mitchell Building, University Park, PA 16802-3693; 814-865-5403.

ADMISSION AND SELECTIVE RETENTION

ADMISSION TO THE COLLEGE—Students who meet the secondary school unit requirements published in the front of this Bulletin meet with representatives from the Office of the Dean prior to enrolling in the University. The student's personal qualifications and the results of aptitude and interest tests are considered in terms of the specific degree program the student proposes to pursue.

ENTRANCE TO A MAJOR—To be eligible for entrance to a major in this college, a degree candidate must be enrolled in the college or satisfy requirements for entrance to the college. In addition, entrance-to-major requirements of the chosen program area must be met. Under certain circumstances, the University may need to limit enrollments in the college or in certain majors because of space limitations. Administrative enrollment controls have been approved for the Elementary and Kindergarten Education, Secondary Education, and Special Education majors. The number of students admitted to these majors each year is limited.

Upon completion of their first year, students review their academic accomplishments and professional goals with their academic advisers before a decision about entrance to a specific major is made. In this declaration of major process, students and advisers review the students' grade-point averages and performances in written and oral communications; in psychological, sociological, and philosophical studies; and in those courses explicitly designed for specialization in the students' chosen majors. See Teacher Education Programs for details.

DEGREES AND DEGREE REQUIREMENTS—The undergraduate majors lead to the B.S. degree. By careful planning, students in some majors may choose to meet University Faculty Senate requirements for earning simultaneous degrees by completing at least 30 additional credits beyond those required in the degree having the fewer total required credits. Alternatively, it is possible for a student in a degree program to meet graduation and teacher certification requirements for multiple majors and teacher certification options. Students should seek additional information from the University Certification Office, The Pennsylvania State University, 228 Chambers Building, University Park, PA 16802-3206.

LEARNING AND PERFORMANCE SYSTEMS

Department head to be announced

This department offers undergraduate programs in Workforce Education and Development. In addition, the department offers graduate programs in Adult Education, Instructional Systems, and Workforce Education and Development. Courses offered are taken for required or elective purposes by students in various undergraduate and graduate programs.

COUNSELOR EDUCATION, COUNSELING PSYCHOLOGY, AND REHABILITATION SERVICES

PROFESSOR ROBERT B. SLANEY, *Head*

This department offers undergraduate programs in Rehabilitation Services, a Ph.D. program in Counseling Psychology, and master's and D.Ed. programs in Counselor Education with courses that are taken for required or elective purposes by students in various undergraduate and graduate programs.

CURRICULUM AND INSTRUCTION

PROFESSOR MURRY R. NELSON, *Head*

There is a growing demand for graduates of teacher education programs. This department offers professional programs leading to certification in early childhood, elementary and kindergarten education, and in a variety of discipline areas leading to certification at the secondary-school level. Admission to a specific teacher certification program occurs only after a student applies to a particular program during or at the conclusion of the first year. See also page 51 of this bulletin. This department also provides a variety of clinical field experiences, including student teaching.

EDUCATION POLICY STUDIES

PROFESSOR JACQUELINE A. STEFKOVICH, Interim Head

This department does not offer programs at the undergraduate level. The department offers courses in Educational Administration, Educational Theory and Policy, and Higher Education, which are taken as required and as elective courses by students in various undergraduate and graduate programs.

EDUCATIONAL AND SCHOOL PSYCHOLOGY AND SPECIAL EDUCATION

PROFESSOR ROBERT J. STEVENS, Head

This department offers an undergraduate program in Special Education as well as courses in Educational Psychology, School Psychology, and Special Education, which are taken as required and elective courses by students in various academic programs.

COLLEGE OF ENGINEERING

DAVID N. WORMLEY, *Dean*
LARRY C. BURTON, *Associate Dean for Administration and Planning*
ROBERT N. PANGBORN, *Associate Dean for Undergraduate Studies and International Programs*
JOHN M. MASON, Jr., *Associate Dean for Graduate Studies, Research, and Outreach*
JEAN LANDA PYTEL, *Assistant Dean for Student Services*

COLLEGE ACADEMIC ORGANIZATION

Acoustics — ANTHONY ATCHLEY, *Chair*
Aerospace Engineering — DENNIS K. McLAUGHLIN, *Head*
Agricultural and Biological Engineering — ROY E. YOUNG, *Head*
Architectural Engineering — RICHARD A. BEHR, *Head*
Bioengineering—HERBERT H. LIPOWSKY, *Head*
Chemical Engineering — HENRY C. FOLEY, *Head*
Civil and Environmental Engineering — ANDREW SCANLON, *Head*
Computer Science and Engineering — RAJ ACHARYA, *Head*
Continuing and Distance Education — TERRY J. REED, *Director*
Electrical Engineering — W. KENNETH JENKINS, *Head*
Engineering Advising Center — JEAN LANDA PYTEL, *Assistant Dean for Student Services*
Engineering Cooperative Education Program — RICK D. McCLINTIC, *Director*
Engineering Instructional Services — JOHN C. WISE, *Director*
Engineering Science and Mechanics — JUDITH A. TODD, *Head*
Engineering Design, Technology, and Professional Programs, School of — DHUSHY SATHIANATHAN, *Interim Head*
Industrial and Manufacturing Engineering — RICHARD J. KOUBEK, *Head*
Leonhard Center for the Enhancement of Engineering Education — THOMAS LITZINGER, *Director*
Mechanical and Nuclear Engineering — RICHARD C. BENSON, *Head*
Multicultural Engineering Programs — AMY L. FREEMAN, *Director*
Quality and Manufacturing Management — CLAYTON RUUD, *Co-Director*
Science, Technology, and Society — MARTIN T. PIETRUCHA, *Director*
Women in Engineering Program — BARBARA BOGUE, *Director*

INTRODUCTION

The COLLEGE OF ENGINEERING is committed to educate students so that they may acquire theoretical knowledge and technical competence in the design, development, and creation of components, systems, and processes to address the needs and problems of our society. The college offers an integrated and professionally oriented curriculum focused on developing engineering graduates who are solidly grounded and technically broad in perspective and capabilities, effective in group operations and communication, versatile in their approach to problem solving and aware of the world.

Resident education at the baccalaureate level is provided through thirteen majors available at University Park and two majors offered at Penn State's campus colleges. In addition, a number of associate degree programs are offered at campus college locations. All baccalaureate degree programs are of eight semesters' duration except Architectural Engineering, which requires ten semesters to complete. Each degree program provides basic elements of general education consistent with the objectives of the program and institution as well as a professional component to prepare graduates for practice in the discipline. All baccalaureate engineering majors at University Park, with the exception of Bioengineering and Computer Science, are accredited by the Engineering Accreditation Commission of ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202-4012; telephone 410-347-7700; or **www.abet.org**.

In each of the engineering disciplines, as designated by the majors, students acquire knowledge of mathematics and the sciences basic to engineering and computer science, and the ability to solve problems through experimentation and analysis. Students develop and exercise initiative, judgment, and creativity through

the professional component and design experiences that are integrated across their baccalaureate study, culminating in a capstone design experience in the senior year. Emphasis is placed on application of the engineering method, the capability for critical thinking, teamwork, and the ability to communicate clearly, both orally and through written composition.

The social-humanistic component of the curriculum extends throughout the baccalaureate study in all majors and provides students with knowledge of social and human relationships as well as an appreciation of cultural interests and contemporary issues. It includes elective courses in the arts, humanities, and social and behavioral sciences. Through these courses and their study in the majors, students learn to appreciate values and costs, the context of engineering in society, and the ethical characteristics of engineering practice.

With this knowledge and set of skills, graduates are positioned to enter technical and non-technical careers in the industrial, government and private sectors, and/or to pursue advanced study in a variety of disciplines. Their versatility and ability to learn independently enable graduates to acquire new skills and knowledge as required by their career choices. The college also administers several academic minors that permit students to broaden or supplement their technical training; obtain specialized training in leadership, entrepreneurship, or product development; or expand their knowledge of the interrelationship of science and society. The Learning Factory, Center for Engineering Design and Entrepreneurship, and Student Activities Center collectively serve the needs of students by providing facilities for project work, computing, and organizational meetings.

The college provides, in addition to undergraduate education, programs in cooperative education, international study and internships, continuing education, research, and advanced study at the graduate level.

ENGINEERING COOPERATIVE EDUCATION PROGRAM—The Engineering Cooperative Education and Internship Program provides opportunities for students to obtain career-related experience while they pursue their undergraduate degree. The program allows students to apply theory learned in the classroom to business, government, and industry while confirming their choice of major. In addition, students develop technical, communication, and job search skills, and receive compensation that can be used to offset the cost of their education.

Students may choose between Internship or Cooperative Education (Co-op) options or elect to integrate the two. Interns may participate in semesters or summers of internship with different employers any time after the second semester of study, or may elect to continue with the same employer by migrating in the Cooperative Education Program. Co-op work assignments alternate with academic periods in school, which are divided into three segments made up of any combination of fall, spring, and summer session (except three summers), but are intentionally flexible to accommodate different students' academic schedules. All Co-op work experiences are paid and career-related, and students advance in responsibility through multiple assignments with one employer. Intern and Co-op participants earn academic credit and Co-op students receive a Certificate of Cooperative Education upon graduation. Both programs are open to engineering students at all campus college locations. Students interested in participating in the programs should refer to the Web site: **www.engr.psu.edu/coop**, e-mail coop@engr.psu.edu, call 814-863-1032, or visit the program office in 205 Hammond Building at the University Park campus. Campus college students should contact their campus representative.

INTERNATIONAL ENGINEERING PROGRAMS—Through its international education programs, the college provides students with opportunities to develop a global perspective, learn how engineering is practiced in other countries, make international contacts, and improve their potential for career advancement. There are also opportunities for students to work abroad for a semester or for the summer through the Global Internship and Cooperative Education Program (GICEP). For example, international work opportunities are available in Germany, France, and Singapore with additional opportunities being developed in Great Britain, Australia, Spain, and several other countries.

Students in the college can earn Penn State credits and/or transfer credits for courses completed abroad through the University's Office of International Programs, which currently has agreements with numerous institutions in all parts of the world. In addition, The Global Engineering Education Exchange (Global E3) is an international exchange program for engineering students at participating universities. The program is designed to allow students to take major-related courses overseas for credit that is useful in meeting degree requirements, and receive practical training in another country.

Also, to illustrate the importance of languages, qualified students can pursue a preapproved concurrent majors program in both an engineering major and either Spanish, French or German. Students in these programs are required to complete courses in Spanish, French or German language and culture, and to intern and/or study in a Spanish-, French- or German-speaking country.

For more information, contact Dr. Robert N. Pangborn, Associate Dean for Undergraduate Studies and International Programs, 101 Hammond Building, University Park, PA 16802 (814-863-3750).

CONCURRENT MAJORS—College of Engineering students may take courses that simultaneously meet academic requirements for more than one major/degree. Most combinations of majors within the college and with majors in other colleges are possible and are developed for individual students in consultation with advisors from the majors involved.

The requirements for some combinations, however, have already been determined and approved. For example, within the college, a combined program for Mechanical Engineering and Nuclear Engineering has been developed. A program with the Letters, Arts, and Sciences (LAS) major in the College of the Liberal Arts

has been approved with all College of Engineering majors except Architectural Engineering. Completion of this program results in the awarding of a B.S. degree in the College of Engineering major and a B.A. degree in LAS from the College of the Liberal Arts. Students may also pursue an established combined degree program with Spanish, French, or German that requires work or study in a Spanish-, French-, or German-speaking country.

Some limitations exist on combinations of majors that are under enrollment control. Students should consult with the college(s) offering the majors of interest for information about combinations that would or would not be approved.

3-2 PROGRAM WITH OTHER INSTITUTIONS AND ENGINEERING—In the 3-2 Program, the student completes three academic years of study at one of several cooperating institutions (with which Penn State has signed agreements) and then transfers to Penn State for two additional academic years. Upon completion of the program, the student is awarded a degree by the first institution and the B.S. degree by Penn State. The program makes it possible for a student to spend the first three years at an institution near one's home, thus reducing expenses.

Arrangements for the 3-2 Program for selected majors are in effect with these institutions: East Stroudsburg University of Pennsylvania, Edinboro University of Pennsylvania, Elizabethtown College, Franklin and Marshall College, Juniata College, Kutztown University of Pennsylvania, Lebanon Valley College, Lock Haven University of Pennsylvania, Millersville University of Pennsylvania, St. Francis College, St. Vincent College, Shippensburg University of Pennsylvania, Slippery Rock University of Pennsylvania, SUNY at Geneseo, Waynesburg College, West Chester University of Pennsylvania, and Bloomsburg University of Pennsylvania. Inquiries concerning admission should be made at these institutions.

CONTINUING AND DISTANCE EDUCATION—The Engineering Outreach office facilitates the delivery of educational programs to non-resident learners—practicing engineers and other technical professionals, the public, and students at other undergraduate campuses and the Continuing Education centers. These learners may attend credit and non-credit programs at the University Park campus or at other undergraduate campuses, and the continuing education centers at Penn State locations throughout Pennsylvania, or they may also access program content from anywhere in the state, nation, and world through technologies such as the Internet, CD-ROM, interactive television, and videotape.

Following is a list of offerings typically available through Engineering Outreach.

—Formal (credit) instruction is available at the undergraduate and graduate levels.

—Informal (non-credit) instruction is provided through short courses, workshops, conferences, and seminars on specialized engineering topics. Professional Engineering review courses are available for practiing engineers planning to seek professional registration in the Commonwealth of Pennsylvania. Management training courses are available for engineers in business and industry.

—Distance study of engineering topics is available through Penn State's World Campus. Both credit and non-credit courses are offered for engineers who cannot come to a campus.

—Customized courses can be made available, to meet specific needs. The college is prepared to custom design programs and delivery options to meet the unique educational needs of a company or group. These programs can be offered either on campus or on-site.

For additional information, contact the Director, Continuing and Distance Education, College of Engineering, The Pennsylvania State University, 410 Rider II Building, University Park, PA 16802 (814-865-7643). For the latest information on Continuing Education programs, follow the Outreach link from the college's home page: **www.engr.psu.edu**.

WOMEN IN ENGINEERING PROGRAM—The Women in Engineering Program (WEP) is an academic support unit of the College of Engineering. WEP serves undergraduate and graduate women, faculty, alumnae, and undertakes extensive programming that supports the college mission, vision, and goals. Programming emphasizes active learning, academic achievement, leadership development, and community building. As such, it provides services and information that address its mission to recruit women into engineering, to facilitate the development of women engineers through advocacy and action, and to actively promote an equitable and productive learning and work environment within the College of Engineering. Activities include academic assistance, developmental course work, career development, industry networking, climate enhancement, mentoring, leadership development, scholarship, and fellowship support, information dissemination, research into gender and assessment issues in engineering education and an external Advisory Board. WEP also offers an extensive program of K–12 camps and workshops, providing leadership opportunities for current students as it encourages future generations of engineers.

MULTICULTURAL ENGINEERING PROGRAMS—The office of Multicultural Engineering Programs focuses on fostering a sense of community in the college. To enhance recruitment and retention, the program provides services designed to nurture supportive and collaborative relationships among students, faculty, staff, alumni, and industrial partners. These services include tutoring, seminars, pre-first-year summer programs, employment workshops and scholarships, with emphasis on proactively seeking out, guiding and preparing students for future success from high school through graduate school. The program promotes academic excellence, industrial and research experience, and personal and professional development.

ENTRANCE TO MAJOR—In addition to the minimum grade point average (GPA) requirements described by University Policies, the College of Engineering has course requirements for admission to all its majors. To be

eligible for consideration for entrance to a major, a student must have completed the following requirements with a minimum grade of C: CHEM 012 GN (or CSE 120 for the Computer Science major), MATH 140 GQ, MATH 141 GQ, and PHYS 211 GN. These must be completed by the end of the semester during which the admission to major process is carried out. Because the Engineering Science major is an honors program, admission is limited to students who attain a cumulative GPA of 3.0.

The Executive Vice President and Provost of the University approves administrative enrollment controls that limit the number of students who may be admitted to some majors in the College of Engineering. In each case, however, academic requirements are established that guarantee a student's admission to those majors. For information on the majors for which enrollment is currently limited and their academic guarantees of admission, contact the Engineering Advising Center, 208 Hammond Building, University Park, PA 16802 (814-863-1033).

PENN STATE ERIE, THE BEHREND COLLEGE

JOHN D. BURKE, *Campus Executive Officer and Dean*
ROBERT W. LIGHT, *Senior Associate Dean for Research, Graduate Studies, and Outreach*
VACANT, *Associate Dean for Undergraduate Studies and Academic Administration*

COLLEGE ACADEMIC ORGANIZATION

Admissions and Financial Aid—MARY-ELLEN MADIGAN, *Director*
Business, Sam and Irene Black School of—JOHN M. MAGENAU III, *Director*
Center for Teaching and Educational Technologies—CARLA N. TORGERSON, *Director*
Computer and Information Systems—RONALD G. HOFFMAN, *Manager*
Corporate and Continuing Education—MARGARET I. McCARTHY, *Director*
Development and University Relations—MARGARET U. TAYLOR, *Director*
Engineering and Engineering Technology, School of—ROBERT J. SIMONEAU, *Director*
Financial Officer and Bursar—CLIFTON R. SANDO
Housing and Food Services—R. RANDALL GEERING, *Manager*
Humanities and Social Sciences, School of—ARCHIE K. LOSS, *Interim Director*
Intercollegiate Athletics—BRIAN F. STREETER, *Director*
Learning Resource Center—RUTH C. PFLUEGER, *Coordinator*
Library—RICHARD L. HART, *Director*
Media and Instructional Support Center—JAMES R. CARROLL, Jr., *Manager*
Operations—JOHN O. REAM, *Director*
Registrar—MARY ELLEN BAYUK, *College Registrar*
Science, School of—ROGER F. KNACKE, *Director*
Student Affairs—KENNETH P. MILLER, *Director of Student Affairs*
Undergraduate Studies, Division of—MICHAEL D. CHITEMAN, *Head*

INTRODUCTION

PENN STATE ERIE, THE BEHREND COLLEGE, located on 725 wooded acres in Erie, Pennsylvania, provides a small-university environment within the context of a major university. With its thirty-one undergraduate programs, Penn State Erie offers an alternative within Penn State to the larger University Park campus. Classes are small and students are encouraged to interact with faculty outside the classroom. Enrolling 3,700 students, Penn State Erie is a comprehensive four-year and graduate college with a full range of supporting services, from residence halls through varsity athletics. The college offers a wide variety of co-curricular activities, including Greek life, eighty clubs and organizations, intramurals, bands and choirs, and a nationally renowned speaker series.

Penn State Erie students can earn the Bachelor of Arts, Bachelor of Science, or Bachelor of Fine Arts degree at the four-year level; they can earn associate degrees in selected two-year programs; or they can complete up to two years of most baccalaureate programs available within the University and then move to other Penn State locations to complete their degree program. Academic enrichment is provided through the Behrend Honors Program and the University-wide Schreyer Honors College as well as through study abroad opportunities and a very active undergraduate research program. The college's programs capitalize on the proximity of such "natural laboratories" as the Erie urban area, Lake Erie, and other nearby resources.

For additional information write to Penn State Erie, The Behrend College, 5091 Station Road, Erie, PA 16563-0101; or visit Penn State Erie on the Web (**www.pserie.psu.edu**).

GENERAL GRADUATION REQUIREMENTS

In order to be certified for graduation, a student must complete the General Education, Writing Across the Curriculum, and Intercultural/International Competence requirements, the First-year Seminar requirements for

the major, and the number of elective credits required in each program. The minimum number of credits for each program is listed in the description of the major. In addition to the minimum number of credits required, each student must earn at least a grade of C in each 300- and 400-level course in the major field and must have earned a minimum 2.00 grade-point average.

REQUIREMENTS FOR ALL B.A. PROGRAMS EXCEPT SCIENCE AT PENN STATE ERIE

GENERAL EDUCATION: 45 credits

Note: The General Education requirements have changed for students enrolled after the summer of 1999. Students enrolled before summer 1999 will continue with their current General Education requirements. Please see General Education on the Web for updates: **www.psu.edu/bulletins/bluebook/gened.**

See **www.psu.edu/bulletins/bluebook/gened/bad.html** for courses that meet University-wide bachelor of arts degree requirements.

COLLEGE BACHELOR OF ARTS DEGREE REQUIREMENTS: 12-24 credits

FOREIGN LANGUAGE (0-12 credits)

Proficiency in a single foreign language must be demonstrated by either examination or course work equivalent to the completion of 12 credits of course work.

ARTS (3 credits)

HUMANITIES (3 credits)

SOCIAL AND BEHAVIORAL SCIENCES (3 credits)

OTHER CULTURES (3 credits)

SAM AND IRENE BLACK SCHOOL OF BUSINESS [1]

PROFESSOR JOHN M. MAGENAU III, *Director*

The Sam and Irene Black School of Business is an academic unit dedicated to high-quality teaching, research, and outreach. The school offers four-year Bachelor of Science degree programs for undergraduate students interested in majors in Accounting; Business, Liberal Arts, and Science; Business Economics; Finance; International Business; Management; Management Information Systems; and Marketing. The school also offers a four-year Bachelor of Arts degree in Economics and an associate degree in General Business. At the graduate level, a Master's in Business Administration (M.B.A.) and a Master's in Project Management are offered. Minors are available in Accounting, Economics, Finance, Management, Management Information Systems, and Marketing. For details, click on Majors and Minors or Courses on the menu at **www.psu.edu/bulletins/bluebook/$bdmenu.htm.**

The late Sam and Irene Black provided Penn State Erie a transformational $20 million estate gift that supports academic quality, innovation, and scholarships. One of Erie Insurance's first employees, Sam Black was a highly successful innovator who later founded his own agency. Pat Black, son of Sam and Irene, is a Penn State graduate and a director of the college's Council of Fellows. In 2003, the Sam and Irene Black School of Business was named in honor of the couple's lifetime support of Penn State Erie, The Behrend College, and the Erie community.

Note: [1]Accredited by the Association to Advance Collegiate Schools of Business, 600 Emerson Road, Suite 300, St. Louis, MO 63141-6762; 314-872-8481

SCHOOL OF ENGINEERING AND ENGINEERING TECHNOLOGY

PROFESSOR ROBERT J. SIMONEAU, *Director*

The school offers seven Bachelor of Science degree programs: Computer Engineering,[1] Electrical Engineering,[1] Electrical Engineering Technology,[2] Mechanical Engineering,[1] Mechanical Engineering Technology,[2] Plastics Engineering Technology,[2] and Software Engineering. In addition, associate degree programs are offered in Electrical Engineering Technology,[2] Mechanical Engineering Technology,[2] and Plastics Engineering Technology.[2]

Design is the central skill required of engineers to be effective problem solvers, and can only be taught through repeated practice. The design experience in the Engineering programs is developed by introducing the various elements and features of design throughout the program. Students are exposed to each of the design elements and features repeatedly and at different levels of complexity. By the time the student reaches the senior design projects course, he or she should have an adequate understanding of the role each design element or feature plays in the design process. Successful completion of the senior design project requires the student to integrate all aspects of design.

For details, click on Majors and Minors or Courses on the menu at:
www.psu.edu/bulletins/bluebook/$bdmenu.htm.

To satisfy the General Education requirements in the Arts, Humanities, and Social and Behavioral Sciences, the student is referred to approved lists and to the General Education Web site:
www.psu.edu/bulletins/bluebook/gened.

Notes
[1]Accredited by the Engineering Accreditation Commission of the Accreditation Board of Engineering and Engineering Technology, 111 Market Place, Suite 1050, Baltimore, MD 21202; 410-347-7700.
[2]Accredited by the Technology Accreditation Commission of the Accreditation Board of Engineering and Engineering Technology, 111 Market Place, Suite 1050, Baltimore, MD 21202; 410-347-7700.

SCHOOL OF HUMANITIES AND SOCIAL SCIENCES

PROFESSOR ARCHIE K. LOSS, *Interim Director*

The school offers six four-year Bachelor of Arts degree programs: Communication and Media Studies, English, General Arts and Sciences (with options in Humanities, Liberal Studies, Science/Mathematics, and Social and Behavioral Sciences), History, Political Science, and Psychology (with options in General Psychology and Business). The school also offers a Bachelor of Science degree program in Psychology and a Bachelor of Fine Arts degree program in Creative Writing. In addition, a two-year associate degree program in Letters, Arts, and Sciences is available. Minors are available in Communication and Media Studies, English, History, International Studies, Political Science, Psychology, and Women's Studies. This school also houses prelaw advising and a four-plus-one teacher certification program. For details, click on Majors and Minors or Courses in the menu at: **www.psu.edu/bulletins/bluebook/$bdmenu.htm**.

SCHOOL OF SCIENCE

PROFESSOR ROGER F. KNACKE, *Director*

The school offers six Bachelor of Science degree programs: Biology (options in General Biology, Ecology, Molecular Biology and Biochemistry, Genetics and Developmental Biology, Medical Technology, Pre-Professional), Chemistry (with options in General Chemistry, Biochemistry, Business, Computer Science, and Chemistry Education Precertification),[1] Computer Science, Mathematics (options in Applied Mathematics, Business, Computer Science, Education Precertification, and General Mathematics), Physics (options in Computational Physics and General Physics), and Science (options in General Science, Environmental Studies, Earth and Space Science Precertification, and General Science Precertification). A Bachelor of Arts degree program in Science is also offered. Minors are available in Biology, Chemistry, Computer Science, Mathematics, Physics, and Statistics. The school also houses Premedical advising. For details, click on Majors and Minors or Courses on the menu at: **www.psu.edu/bulletins/bluebook/$bdmenu.htm**.

Note: [1]Major has American Chemical Society approval.

DIVISION OF UNDERGRADUATE STUDIES

PROFESSOR MICHAEL D. CHITEMAN, *Director*

The Division of Undergraduate Studies (DUS) is an academic unit of Penn State Erie that offers all undergraduate students University programs and services relating to (1) precollege testing, counseling, and advising for entering first-year students; (2) enrollment and registration for students who want to explore several areas of study before identifying a specific area of academic study, and for students who encounter changes in interest and career objectives and seek enrollment in DUS on an interim basis; (3) professional advising, counseling, and referral services coordinated through the services of the colleges and faculty; and (4) an undergraduate academic information center that provides students and faculty with current information on the many academic programs offered throughout the University.

INTERCOLLEGIATE ATHLETICS

BRIAN F. STREETER, *Athletic Director*

Penn State Erie offers twenty-one sports for men and women and is a member of the National Collegiate Athletic Association (NCAA) Division III and a founding member of the Allegheny Mountain Collegiate Conference. Penn State Erie is also affiliated with the Eastern College Athletic Conference (ECAC). The college subscribes to the Division III philosophy of competition and embraces the concepts of fair play and equity in all programs. Men's varsity sports are baseball, basketball, cross-country, golf, indoor track and field, soccer, swimming and diving, tennis, track and field, and water polo. Women's varsity sports are basketball, cross-country, golf, indoor track and field, soccer, softball, swimming and diving, tennis, track and field, volleyball, and water polo.

COLLEGE OF HEALTH AND HUMAN DEVELOPMENT

RAYMOND T. COWARD, *Raymond E. and Erin Stuart Schultz Professor and Dean*
FRED W. VONDRACEK, *Associate Dean for Undergraduate Studies and Outreach*
KARL M. NEWELL, *Associate Dean for Research and Graduate Education*
PAULA MILONE-NUZZO, *Associate Dean for International Partnerships*

COLLEGE ORGANIZATION

School of Hotel, Restaurant, and Recreation Management—TBA, *Director*
School of Nursing—PAULA MILONE-NUZZO, *Director*
Department of Biobehavioral Health—LYNN T. KOZLOWSKI, *Head*
Department of Communication Sciences and Disorders—GORDON W. BLOOD, *Head*
Department of Health Policy and Administration—DENNIS G. SHEA, *Head*
Department of Human Development and Family Studies—STEVEN H. ZARIT, *Head*
Department of Kinesiology—PHILIP E. MARTIN, *Head*
Department of Nutritional Sciences—MICHAEL H. GREEN, *Head*

INTRODUCTION

Improving human lives through innovative research, teaching, and service activities is and always has been the defining goal of the COLLEGE OF HEALTH AND HUMAN DEVELOPMENT. Created in 1987 through the combination of strong programs offered by other Penn State colleges, the College of Health and Human Development was the first in the country to take a combined approach to the health, development, and well being of individuals and families. The college seeks to improve the quality of human life through all three of its missions: conducting research, providing education for students who are planning professional careers in the field, and offering outreach programs for health-services professionals as well as the general public.

The field of health and human development encompasses a wide range of professions. Programs in the college help students prepare for careers in health care, nursing, nutrition and dietetics, athletic training, rehabilitation and therapy, sports medicine, child care, human services, gerontology, speech pathology and audiology, health promotion, fitness and sports, health-care management, hospitality, tourism, recreation and parks, education, research and several others. Many students go on to medical or dental school or other graduate study.

The college has two schools and six departments offering programs consistently ranked among the top of their kind in the nation; ten highly successful interdisciplinary research centers addressing major societal problems and influencing policies geared toward tackling those problems; twenty-nine laboratories conducting leading-edge research providing undergraduate and graduate students world class faculty and facilities to enhance their academic and professional interests; and nine units providing various clinical and other services which have an immediate impact on those they serve. These units span a variety of disciplines with one common goal: improving the health and well being of our society.

The faculty represents some of the most respected leaders in their disciplines, including Fellows, presidents and board/committee members of numerous national academies and organizations. Penn State regularly recognizes the college's faculty for excellence in teaching, advising, research, and actively engaging students. The accomplishments of the faculty speak volumes about the stimulating intellectual environment that the college has been able to create and sustain since its inception.

RESEARCH—Research in the college focuses on significant areas of human development and human health. Faculty conduct both basic and applied studies and receive funding from the University, state and federal agencies, and other public and private sponsors. Faculty members are especially well known for their research in child development, aging, family relationships, leisure behavior, human physical performance, nutrition, and the genetics of behavior. In addition to the research programs based in each of the academic departments, there are strong interdepartmental and interdisciplinary research programs within the college. The college cooperates with regional, national, and international industries, and government agencies in identifying trends and advancing scientific inquiry. The college's research efforts have resulted in a nearly fivefold increase in external funding during the past decade.

OUTREACH AND CONTINUING EDUCATION—As part of Pennsylvania's original land-grant university, the college has a strong commitment to extend the knowledge and expertise of the faculty to health-care professionals, school personnel, human service providers, community leaders, parents, and many others through a wide range of outreach activities including conferences, workshops, clinical services, continuing and distance education programs, youth camps, and service learning opportunities.

INTERNATIONAL PROGRAMS—The college and its faculty have many mutually beneficial relationships with universities on all continents. The college works with International Programs to support students who are interested in incorporating study abroad or other international experiences into their academic plans.

UNDERGRADUATE EDUCATION

UNDERGRADUATE DEGREE PROGRAMS—The college offers nine undergraduate majors that help to prepare students for careers in some of the nation's most important and rapidly growing fields. The majors are: Biobehavioral Health; Communication Sciences and Disorders; Health Policy and Administration; Hotel, Restaurant and Institutional Management; Human Development and Family Studies; Kinesiology; Nursing; Nutritional Sciences; and Recreation and Park Management.

All of the majors have four common objectives. (1) Students should earn a broad education in the basic areas of human knowledge (i.e., natural sciences, social and behavioral sciences, and arts and humanities) and in the processes of human development. (2) A professional component should be included to help students prepare for health and human service careers or for advanced study. (3) Students should spend time applying their classroom knowledge to real-life situations. (4) Students should explore various areas of interest, and with the help of their advisers, plan a program of study that emphasizes the students' backgrounds, talents, and goals.

Field projects, clinical experiences in various settings, and special laboratory opportunities are an integral part of most majors. These may involve additional expenses, such as travel to community settings, which are paid by the student.

The college offers instruction at both the undergraduate and graduate levels. General requirements for advanced degrees are described at **www.psu.edu/bulletins/whitebook**, the *Graduate Degree Programs Bulletin.*

BASIC INSTRUCTION—An objective of the General Education program of the University is for all students to know how to achieve and maintain good health and to attain a degree of skill in recreational activities. In support of this objective, the Departments of Biobehavioral Health, Kinesiology, and Nutritional Sciences, and the School of Nursing offer courses about health and nutrition issues. The Department of Kinesiology offers courses that provide the opportunity for students to improve cardiovascular fitness, learn physical and recreational skills for lifetime use, and gain knowledge of exercise and sport. Instruction is offered in many activity areas, including dance, sport, aquatics, fitness, and adventure activities. Adapted physical education programs are individually arranged upon recommendation of University Health Services for those students with medical restrictions. Students whose personal or physical circumstances support the need for more individualized programs may petition for independent study or individual assignment. For more information, visit **www.psu.edu/bulletins/bluebook/gened**, General Education Web site.

GENERAL GRADUATION REQUIREMENTS

BACHELOR OF SCIENCE DEGREE

Students are typically admitted to the College of Health and Human Development and may request admission to a major in their fourth semester of enrollment. Two exceptions are Nursing and the Professional Golf Management program, which admit first-year students.

During the freshman and sophomore years, all students are expected to take basic courses appropriate to their intended major as well as selected General Education courses. Judicious choice of these courses helps the student select a major at the end of the sophomore year.

Students, in consultation with an adviser and according to their background, interests, and career objectives, select specific courses to meet the requirements of the major and to promote their professional and personal development. Guidelines for selection are established by faculty in charge of each major and include courses both in the College of Health and Human Development and in other colleges.

Specific requirements for each option in a major are available through the college's Student Services Center. ROTC courses are voluntary and are counted as electives in meeting graduation requirements.

To be eligible for entrance to a major in the college, a degree candidate must be enrolled in, or satisfy requirements for entrance to the college. In addition, the degree candidate must meet entrance-to-major requirements of the University and the department. Under certain circumstances, the University may need to limit enrollments in the college or in certain majors because of space limitations.

TEACHER PREPARATION PROGRAMS—One of the college's degree programs, Kinesiology, offers an option in teacher certification. See Teacher Education Programs for general information and special requirements regarding teacher certification.

SCHOOL OF INFORMATION SCIENCES AND TECHNOLOGY

JAMES B. THOMAS, *Dean*

JOSEPH M. LAMBERT, *Senior Associate Dean*

DAVID L. HALL, *Associate Dean for Research and Graduate Programs*

SUSAN B. SHUMAN, *Assistant Dean for Equity and Diversity*

STANLEY B. SUPON, *Assistant Dean for Undergraduate Programs*

The goal of the School of Information Sciences and Technology (IST) is to help build a new generation of leaders to meet the complex and compelling demands of the digital age.

IST's baccalaureate and associate degree programs were designed with substantial input from business, industry, and government. These programs are meant to develop professionals who have an in-depth knowledge

of computers and computer applications, as well as the ability to express and defend ideas, lead teams, and solve problems by putting information technology to work.

The course of study in IST includes work in database, networks, mathematics, programming, emerging technologies, organizations and information, integration of IT, human-computer interface, information policy and regulation, and information systems. Both the baccalaureate and associate degree programs require a professional internship.

The baccalaureate program allows students to choose one of three options—Information Systems: Design and Development; Information Technology: Integration and Application; and Information Context: People, Organizations, and Society. All students will have to take eight core courses and a senior "capstone" course. Bachelor's degree students also are required to be knowledgeable of other cultures and fluent in a language other than English.

Graduates with a bachelor's degree have received offers for professional positions such as these: software analyst, consultant, head graphics designer, project manager, systems analyst, program specialist, GIS specialist, computer engineer, technology development, commercial applications, integration analyst, and systems engineer.

The associate degree program shares the same core as the baccalaureate program and provides options in business, software, network, Web administration, industrial/manufacturing, data/information, and telecommunications. In addition, there is an option that fulfills many bachelor's degree requirements, allowing students to more easily further their studies. IST also offers an associate degree program that permits students to customize a program of study meet their individual needs.

Depending on what option they take, graduates with associate degrees are competitive for positions such as these: database administrator, information manager, information technologist, local- or wide-area network administrator, systems administrator, telecommunications analyst, telecommunications technologist, Web administrator or programmer, and Webmaster.

Several joint minors, listed below, are available for students throughout the University who are looking to build an academic program that includes courses in information sciences and technology.
—Information Sciences and Technology
—Information Sciences and Technology for Earth and Mineral Sciences
—Information Sciences and Technology in Health Policy Administration
—Information Sciences and Technology for Hotel, Restaurant, and Institutional Management
—Information Sciences and Technology for Mathematics
—Information Sciences and Technology for Speech Communication
—Information Sciences and Technology for Telecommunications
—Digital Arts and Information Sciences and Technology
—Supply Chain and Information Sciences and Technology

ENTRANCE TO MAJOR—In addition to the minimum grade-point average (GPA) requirements described by University policies, the School of Information Sciences and Technology has course requirements for entrance to its major. To be eligible for consideration for entrance to the major, a student must have completed the following requirements with a minimum grade of C: IST 110, IST 210, and IST 220. These must be completed by the end of the semester during which the entrance to the major process is carried out.

Administrative enrollment controls are in effect at the University Park campus, limiting the number of students entering the IST major at this Penn State location. Entrance to the major at University Park will depend on the ranking of the student's cumulative GPA relative to the enrollment limit. Students are guaranteed entrance to the major if their cumulative GPA is at least 3.0. (Note: This guarantee is not the minimum GPA required.)

COLLEGE OF THE LIBERAL ARTS

SUSAN WELCH, *Dean*
RAYMOND E. LOMBRA, *Associate Dean for Research, Graduate Studies, and College Advancement*
RONALD L. FILIPPELLI, *Associate Dean for Administration and Undergraduate Studies*

COLLEGE ACADEMIC ORGANIZATION

African and African American Studies — KIDANE MENGISTEAB, *Head*
Anthropology — DEAN R. SNOW, *Head*
Classics and Ancient Mediterranean Studies — GERALD N. KNOPPERS, *Head*
Communication Arts and Sciences — JAMES DILLARD, *Head*
Comparative Literature — CAROLINE D. ECKHARDT, *Head*
Economics — ROBERT MARSHALL, *Head*
English — ROBERT CASERIO, *Head*
American Studies — ROBERT LOUGY, *Director*

French — THOMAS A. HALE, *Head*
Germanic and Slavic Languages and Literatures — ADRIAN WANNER, *Head*
History — A. G. ROEBER, *Head*
Religious Studies — WILLIAM PETERSEN, *Director*
Jewish Studies — BRIAN HESSE, *Director*
Labor Studies and Industrial Relations — PAUL CLARK, *Head*
Linguistics and Applied Language Studies — KAREN JOHNSON, *Director*
Philosophy — MITCHELL ABOULAFIA, *Head*
Political Science — FRANK R. BAUMGARTNER, *Head*
Psychology — KEVIN MURPHY, *Head*
Sociology — GLENN FIREBAUGH, *Head*
Crime, Law, and Justice — GLENN FIREBAUGH, *Director*
Spanish, Italian, and Portuguese — JOHN M. LIPSKI, *Head*
Women's Studies — CAROLYN E. SACHS, *Director*

INTRODUCTION

The COLLEGE OF THE LIBERAL ARTS has two primary functions: (1) to provide a specialized education, both graduate and undergraduate, in the basic disciplines of the humanities and the social and behavioral sciences, and (2) to provide general education courses that enrich the cultural understanding of students in all colleges of the University.

In addition to participating in the Liberal Arts undergraduate courses, majors, and minors (disciplinary and interdisciplinary), students may enhance their studies by combining their Liberal Arts major with any minor in the University.

TEACHER CERTIFICATION PROGRAMS—Students may satisfy requirements for the provisional certificate for teaching in the Commonwealth of Pennsylvania, while also satisfying requirements for a bachelor's degree, with a major in the College of the Liberal Arts in one of the following: English, French, German, Latin, Russian, and Spanish. Students who want to prepare for teacher certification should consult their advisers and the University Certification Office, 228 Chambers Building. See also Teacher Education Programs in this bulletin.

PREPROFESSIONAL PROGRAM—Students who want to qualify for entrance to professional schools of medicine, dentistry, or other health fields may adapt any one of several majors; the Letters, Arts, and Sciences major is particularly suited for this purpose. Students who want to qualify for entrance to professional schools of law may adapt any one of several majors. Under certain conditions a student may earn the B.A. degree after completing six satisfactory semesters at The Pennsylvania State University and one year at an accredited professional school.

CONCURRENT MAJOR PROGRAM—A program is available for students to obtain in five academic years of study a bachelor of arts awarded by the College of the Liberal Arts and a bachelor of science by the College of Engineering or the College of Earth and Mineral Sciences. This program permits students to obtain a liberal education as well as technical preparation for a career. For more information, see the entries in the Majors section of this bulletin under LIBERAL ARTS AND EARTH AND MINERAL SCIENCES CONCURRENT MAJOR PROGRAM or LIBERAL ARTS AND ENGINEERING CONCURRENT MAJOR PROGRAM.

RESIDENT EDUCATION

RONALD L. FILIPPELLI, *Associate Dean for Administration and Undergraduate Studies, in charge*

For at least the first two semesters, students are classified as Liberal Arts (LA). To be eligible for entrance to a major in this college, a degree candidate must meet the entrance-to-major requirements listed below. By the end of the sophomore year, a student must declare one of the Liberal Arts majors described in the bulletin. (Please note: Under certain circumstances, the University may need to limit enrollments in the college or in certain majors because of space limitations.) Most majors and minors are administered by specific departments; students who want information about one of these majors should consult the appropriate department or program. Most majors in the college lead to the bachelor of arts degree; some of the majors in the college offer both the bachelor of arts and the bachelor of science degrees.

ADMISSION

Students must meet the secondary school unit requirements as published in the General Information section of this bulletin. Note: Effective for students graduating from high school in 2001 or later, those who have not completed the recommended two high school foreign language units will need to schedule the appropriate foreign language course work at Penn State within their first two years of study.

ENTRANCE-TO-COLLEGE REQUIREMENTS

Any student may enter the college provided that the following requirements have been met:
1. The student must have a 2.00 cumulative grade-point average.
2. The student must demonstrate the ability to complete total requirements within nine semesters.
3. The student must have completed the appropriate Carnegie Units as listed previously.

ENTRANCE-TO-MAJOR REQUIREMENTS

Any student may enter a Liberal Arts major provided that the following requirements have been met:
1. The student must have a 2.00 cumulative grade-point average.
2. The student must have an average of C (2.00) or better in any courses already taken in the proposed major.
3. The student must demonstrate the ability to complete total requirements within nine semesters.
4. The student must have completed 27.1 credits or higher.

GENERAL GRADUATION REQUIREMENTS

All baccalaureate degree candidates must follow the graduation requirements as established by the Senate.
1. Minimum 2.00 cumulative grade-point average.
2. Completion of minimum total credits for graduation.
3. Completion of all General Education, College (B.A. degrees only), elective, and major requirements. General Education requirements have changed for students enrolling summer session 1999 and thereafter. Students who enrolled prior to summer session 1999 should continue with current requirements. All students in the College of the Liberal Arts must complete 9 credits of natural science, including one laboratory science. In addition, all Liberal Arts students must complete one first-year seminar, one intercultural and international competence course, and one writing-intensive course. For more information, visit the General Education Web site at **www.psu.edu/bulletins/bluebook/gened**.
4. All courses fulfilling major requirements must be completed with a grade of C or higher.
5. Students wishing to graduate with a minor must apply for the minor no later than 5:00 p.m. on the published deadline. All required course work must be completed with grade of C or higher by the end of the semester the student plans to graduate.
6. Students in bachelor of arts degree programs must complete level 003 of a foreign language with a D or higher.
7. Students in Bachelor of Science degree programs must have either 2 Carnegie Units of foreign language completed prior to admission to Penn State, or a grade of C or higher in college level 001 or 002 of a foreign language, or a grade of D or higher in college level 3.
Note 1: Duplicate courses, ENGL 004, ENGL 005; MATH 001, MATH 002, MATH 003, MATH 004; ESL 004, and SPCOM 004 cannot be counted toward the total number of credits required for graduation.

BACCALAUREATE DEGREE REQUIREMENTS
BACHELOR OF ARTS AND BACHELOR OF SCIENCE DEGREES

GENERAL EDUCATION: 45 credits
(Same for bachelor of arts **AND** bachelor of science)
(See description of General Education in front of this bulletin.)

COLLEGE BACHELOR OF ARTS DEGREE REQUIREMENTS: 12–24 credits

FOREIGN LANGUAGE (0–12 credits)
Proficiency in a single foreign language must be demonstrated by either examination or course work equivalent to completion of 12 credits of course work. See the Admission section of the General Information in this bulletin for the Placement Policy for Penn State Foreign Language Course (under Opportunities for Credit by Acquisition).
ARTS (3 credits)
HUMANITIES (3 credits)
SOCIAL AND BEHAVIORAL SCIENCES (3 credits)
OTHER CULTURES (3 credits)

Note: Other cultures courses may not be double-counted with intercultural and international competence courses.

ELECTIVES: 15 credits or more, depending on major (Same for bachelor of arts **AND** bachelor of science.)

MAJOR REQUIREMENTS: See description of major degree requirements in this bulletin.

NOTE: See **www.psu.edu/bulletins/bluebook/gened/bad.html** for courses that meet University-wide bachelor of arts degree requirements.

EBERLY COLLEGE OF SCIENCE

DANIEL J. LARSON, *Dean*
NORMAN FREED, *Associate Dean*
KARIN E. FOLEY, *Assistant Dean*

COLLEGE ACADEMIC ORGANIZATION

Astronomy and Astrophysics — LAWRENCE W. RAMSEY, *Head*
Biochemistry and Molecular Biology — ROBERT A. SCHLEGEL, *Head*
Biology — DOUGLAS CAVENER, *Head*
Chemistry — ANDREW EWING, *Head*
Computer Science — RAJ ACHARYA, *Head*
Mathematics — NIGEL HIGSON, *Head*
Physics — JAYANTH R. BANAVAR, *Head*
Statistics — JAMES ROSENBERGER, *Head*

INTRODUCTION

On March 17, 1989, Penn State's Board of Trustees renamed the College of Science to honor one of its most generous benefactors—the Eberly Family Charitable Trust of Uniontown. The generosity of the Eberly family has enabled the college to attract and retain outstanding faculty members who work at the cutting edge of their fields and who create opportunities for study and research that attract topflight graduate and undergraduate students.

The EBERLY COLLEGE OF SCIENCE provides instruction and research opportunities in the biological, mathematical, and physical sciences for students in this and other colleges in the University. The college offers ten majors that lead to the B.S. degree and two (Mathematics and Science) that lead to either the B.S.or B.A. degree. Various options are available within many of the majors. Many graduates continue their education in graduate or professional schools while others choose from a variety of careers in industry, government, or education.

UNDERGRADUATE INSTRUCTION — In the first four semesters, basic biological and physical science, mathematics, and English are emphasized. Those who show an aptitude for scientific or mathematical work at the end of these four semesters continue in the major of their choice. To be eligible for entrance to a major in this college, a degree candidate must be enrolled in the college or satisfy requirements for entrance to the college. In addition, the degree candidate must meet entrance-to-major requirements of the University, of the college, and of the program area.

ENTRANCE-TO-COLLEGE REQUIREMENTS

In order to be eligible for entrance to the Eberly College of Science in premajor (SCIEN) status, a student must have:
1) Attained at least a 2.00 cumulative grade-point average
2) Completed MATH 140 with a grade of C or better

A student who meets the above requirements, but who has not demonstrated a comparable level of scholarship in other mathematics and science courses applicable to the programs of the college, is strongly encouraged to contact the Eberly College of Science Academic Advising Center or other appropriate advising personnel for assistance.

ENTRANCE-TO-MAJOR REQUIREMENTS

In order to be eligible for entrance to a major in the Eberly College of Science, a student must have:
1. Attained at least a 2.00 cumulative grade-point average
2. Completed MATH 140 with a grade of C or better
3. Satisfied all additional academic requirements as specified by the major

(**Note:** Additional academic requirements are listed in the this bulletin under the heading of the specific major.)

CONTINUING AND DISTANCE EDUCATION

Activities in Continuing and Distance Education include class and correspondence instruction in credit and noncredit courses and informal instruction.

CLASS INSTRUCTION—Instruction in the sciences is offered upon request, provided suitable facilities and faculty are available. Some courses carry college credit and are open only to qualified students; other courses are noncredit and are designed for adults interested in vocational or cultural self-improvement.

CORRESPONDENCE COURSE—College-credit courses in the physical, biological, and mathematical sciences are available through Penn State's World Campus.

INFORMAL INSTRUCTION—These programs are designed to fit the needs of individuals and groups interested in some special phase of adult education, new developments in the field, or professional and industrial applications of new scientific discoveries. Tailored specifically to meet the needs and interests of the groups to be served, the programs are developed in conjunction with the groups themselves.

COOPERATIVE EDUCATION PROGRAM CREDIT POLICY

Each department within the college will allow a maximum of 6 Co-op credits to be used toward degree requirements. These credits will be earned at a maximum of 2 for each Co-op semester/course (SCIENCE 295, 395, 495). Specific use of Co-op credits is to be determined by the individual departments, based on curricular

requirements. Departments will provide Co-op office representatives with an overview of ways in which each department will recognize Co-op credits, but students must confer with a department representative to discuss their individual academic circumstances. Exceptions to the 2-credits-per-Co-op semester policy and the maximum of 6 total Co-op credits policy may be possible, but must be approved by a departmental representative in advance of students' registration for the credits. Retroactive credit for Co-op experiences will not be granted.

INTERCOLLEGE UNDERGRADUATE PROGRAMS

The University offers intercollege undergraduate academic programs in addition to conventional baccalaureate degree programs. The intercollege programs draw on the resources of faculty and courses from several colleges.

JANIS E. JACOBS, Vice Provost for Undergraduate Education and International Programs

INTERCOLLEGE UNDERGRADUATE PROGRAM COMMITTEES

Majors:
Bachelor of Philosophy — JEREMY COHEN, *Chair*

Minors:
Astrobiology — CHRISTOPHER H. HOUSE, *Chair*
Environmental Inquiry — AMY K. GLASMEIER, *Professor-in-charge*
Gerontology — MELISSA A. HARDY, *In Charge*
Marine Sciences — LEE R. KUMP, *Chair*
Military Studies — *See* ROTC *for information*
Neuroscience — Byron C. Jones, *Chair*

RESERVE OFFICERS' TRAINING CORPS

ARMY

MILITARY SCIENCE
LIEUTENANT COLONEL ROBERT A. MALLOY, United States Army
Professor of Military Science

NAVY

NAVAL SCIENCE
CAPTAIN DONALD J. BOLAND, United States Navy
Professor of Naval Science

AIR FORCE

AIR FORCE AEROSPACE STUDIES
COLONEL PAUL M. NEIHEISEL, United States Air Force
Professor of Aerospace Studies

Academic Program Descriptions

NOTE

Information in this section was current as of March 1, 2004. Please see the Undergraduate Bulletin on the Web for more current information: **www.psu.edu/bulletins/bluebook**

Information on Faculty in Charge

See the College Information section in this bulletin for heads of college academic areas. See the Undergraduate Bulletin on the Web (**www.psu.edu/bulletins/bluebook**) for current faculty in charge of specific academic programs, or contact the appropriate college for further information.

ASSOCIATE DEGREE PROGRAMS

AGRICULTURAL BUSINESS

College of Agricultural Sciences; Berks-Lehigh Valley College

The Agricultural Business major helps prepare students for employment in commercial agriculture and businesses serving agriculture. Five options allow students to specialize in either Crop or Animal Production, Food, Horticulture, or General Agricultural Business, which provides training in management, business organization, and sales.

The first two semesters are offered at selected locations, where students fulfill basic course requirements in accounting, business, English, and natural and social sciences. The second year at University Park campus provides course work in livestock and crop production, management, and agricultural business. As part of the requirements, there are supporting courses in agricultural engineering, farm management, agricultural marketing, and sales. Each option allows the student a choice of electives to satisfy special interests and needs.

For the Associate in Science degree in Agricultural Business, a minimum of 68 credits is required.

GENERAL EDUCATION: 21 credits
(9-12 of these 21 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

ELECTIVES: 0-5 credits

REQUIREMENTS FOR THE MAJOR: 54-58 credits
(This includes 9-12 credits of General Education courses: 6 credits of GWS courses; 3 credits of GN courses; 0-3 credits of GS courses)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 21 credits

PRESCRIBED COURSES (14 credits)
BIOL 110 GN(4), ENGL 015 GWS(3), CAS 100 GWS(3) (Sem: 1-2)
ACCTG 211(4)[1] (Sem: 1-4)

ADDITIONAL COURSES (7 credits)
ENGL 202A GWS(3) or ENGL 202D GWS(3) (Sem: 1-2)
BIOL 220W GN(4), BIOL 230W GN(4), or BIOL 240W GN(4) (Sem: 1-2)

REQUIREMENTS FOR THE OPTION: 33-37 credits

ANIMAL PRODUCTION OPTION: 37 credits
PRESCRIBED COURSES (22 credits)
B LAW 243(3), CHEM 011(3) (Sem: 1-2)
AGRO 028(3), AN SC 100(3), AN SC 202(3), A S M 101(3),
PTYSC 201(1), SOILS 101 GN(3) (Sem: 3-4)

ADDITIONAL COURSES (6 credits)
AG BM 101 GS(3)[1], AG BM 106(3)[1], or AG EC 208(3)[1] (Sem: 3-4)
AN SC 007(3)[1] or AN SC 201(3)[1] (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 6 credits in agricultural economics (Sem: 3-4)
Select 3 credits in agricultural systems management (Sem: 3-4)

CROP PRODUCTION OPTION: 34 credits
PRESCRIBED COURSES (25 credits)
B LAW 243(3), CHEM 011(3) (Sem: 1-2)
A S M 101(3), A S M 206(4), AG BM 102(3), AGRO 028(3), ENT 012(3), SOILS 101 GN(3) (Sem: 3-4)

ADDITIONAL COURSE (3 credits)
AG BM 101 GS(3)[1], AG BM 106(3)[1], or AG EC 208(3)[1] (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 3 credits in animal science or poultry science (Sem: 3-4)
Select 3 credits in horticulture[1] (Sem: 3-4)

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[1]A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

FOOD OPTION: 36 credits
PRESCRIBED COURSES (36 credits)
CHEM 012(3), CHEM 014(1), MICRB 106 GN(3), MICRB 107 GN(1) (Sem: 1-2)
AG BM 101 GS(3)[1], B A 250(3), FD SC 200(3)[1], FD SC 201(1), FD SC 205(3), FD SC 206(3), M I S 103(3), MGMT 100(3), MKTG 221(3), NUTR 251 GHA(3) (Sem: 3-4)

GENERAL OPTION: 36 credits
PRESCRIBED COURSES (12 credits)
B LAW 243(3), CHEM 011(3) (Sem: 1-2)
AGRO 028(3), SOILS 101 GN(3) (Sem: 3-4)

ADDITIONAL COURSES (12 credits)
AG BM 101 GS(3)[1] or AG EC 208(3)[1]; AG BM 102 or AG EC 232(3) (Sem: 3-4)
AG BM 106 or AG BM 200(3) (Sem: 3-4)
MGMT 100(3)[1] or MKTG 220(3)[1] (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 3 credits in agriculture or business (Sem: 3-4)
Select 3 credits in agricultural systems management (Sem: 3-4)
Select 6 credits in animal or poultry science (Sem: 3-4)

HORTICULTURE OPTION: 33 credits
PRESCRIBED COURSES (33 credits)
CHEM 011(3), HORT 101(3)[1], HORT 138(3) (Sem: 1-2)
AG BM 101 GS(3)[1], B A 250(3), HORT 202(3), HORT 430W(3),
M I S 103(3), MGMT 100(3), MKTG 221(3), SOILS 101 GN(3) (Sem: 3-4)

ARCHITECTURAL ENGINEERING TECHNOLOGY

School of Engineering Design, Technology, and Professional Programs, College of Engineering; Program Coordinator, Penn State Wilkes-Barre

This major is designed to provide technically trained personnel between the level of high school graduate and professional engineer or architect to support the architectural design/construction industry, and technical support firms.

Graduates of the Architectural Engineering Technology major may qualify for admission to baccalaureate degree majors in Environmental Engineering Technology, Mechanical Engineering Technology, or Structural Design and Construction Engineering Technology offered at Penn State Harrisburg.

For the Associate in Engineering Technology degree in Architectural Engineering Technology, a minimum of 72 credits is required. This program is accredited by the Technology Accreditation Commission of ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202-4012, telephone: 410-347-7700, or **www.abet.org.**

GENERAL OPTION: This option helps prepare students to translate sketches and design concepts into working drawings and specifications, and to work with architects, structural engineers, and all phases of the building/construction industry.

BUILDING ENVIRONMENTAL SYSTEMS TECHNOLOGY OPTION: This option helps prepare students for the heating, ventilating, air conditioning, and refrigeration (HVAC&R) industry as system designers, equipment sales representatives, building automation supervisors, and indoor air quality specialists.

GENERAL EDUCATION: 21 credits
(12 of these 21 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 63–64 credits
(This includes 12 credits of General Education courses: 3 credits of GN courses; 3 credits of GQ courses; 6 credits of GWS courses)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 42 credits

PRESCRIBED COURSES (42 credits)
AE T 101(3)[1], AE T 102(3), AE T 103(3), CMPSC 101 GQ(3), EG T 101(1), EG T 102(1), ENGL 015 GWS(3), MATH 081 GQ(3), MATH 082 GQ(3), PHYS 150 GN(3) (Sem: 1-2)
AE T 204(3), AE T 210W(3)[1], CAS 100 GWS(3), MATH 083(4), PHYS 151(3) (Sem: 3-4)

REQUIREMENTS FOR THE OPTION: 21–22 credits

[1]A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

GENERAL OPTION: 21–22 credits
PRESCRIBED COURSES (16 credits)
AE T 113(2), MCH T 111(3) (Sem: 1-2)
AE T 206(2), AE T 207(3), AE T 214(3)[1], AE T 215(3) (Sem: 3-4)

ADDITIONAL COURSES (5–6 credits)
Select 5–6 credits from the following technical courses: AE T 212(3), AE T 297(1-9), CHEM 011(3), CMPSC 102(3), EE T 100(3), EG T 201(2), EG T 297(1-9), IE T 105(2), MATH 140 GQ(4), MATH 231(2), MATH 250(3), MCH T 213(3), ME T 207(3), ME T 281(4) (Sem: 3-4)

BUILDING ENVIRONMENTAL SYSTEMS TECHNOLOGY OPTION: 21 credits
PRESCRIBED COURSES (15 credits)
AE T 121(2), ME T 281(4) (Sem: 1-2)
AE T 227(3), AE T 228(3), AE T 229(3) (Sem: 3-4)

ADDITIONAL COURSES (6 credits)
Select 6 credits from the following technical courses: AE T 212(3), AE T 297(1-9), CHEM 011(3), CMPSC 102(3), EE T 100(3), EG T 201(2), EG T 297(1-9), IE T 105(2), MATH 140 GQ(4), MATH 231(2), MATH 250(3), MCH T 213(3), ME T 207(3), ME T 281(4) (Sem: 3-4)

BIOMEDICAL ENGINEERING TECHNOLOGY

School of Engineering Design, Technology, and Professional Programs, College of Engineering; Program Coordinator, Penn State New Kensington

During the past several decades, the medical community has grown to depend increasingly on machines for the delivery of quality health care. Biomedical technicians are men and women responsible for maintaining these machines in accurate and safe working order. Their tasks include functional and safety inspecting, preventive maintenance, calibration, troubleshooting, and repair of this equipment. In addition, they may be involved in equipment control programs, in electrical safety assurance programs, and in training hospital personnel in the safe and proper use of the equipment. The classroom and laboratory portions of this major focus on electronically based patient monitoring and life-support equipment. The student is, however, exposed to a much broader spectrum of biomedical equipment through a 400-hour (ten-week) practical internship in an approved health care facility.

This program also articulates with Pennsylvania Department of Education approved-Tech Prep programs. Secondary school Tech Prep students who have graduated from a program covered by a signed Penn State Tech Prep Articulation Agreement may be eligible for special admission procedures and/or advanced placement. Graduates of the program may qualify for admission to the baccalaureate degree major in Electrical Engineering Technology offered at Penn State Harrisburg and at Penn State Erie, The Behrend College.

For the Associate in Engineering Technology degree in Biomedical Engineering Technology, a minimum of 74 credits is required. This program is accredited by the Technology Accreditation Commission of ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202-4012, telephone: 410-347-7700, or **www.abet.org**.

GENERAL EDUCATION: 21 credits
(12 of these 21 credits are included in the REQUIREMENTS FOR THE MAJOR) (See description of General Education in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 65 credits
(This includes 12 credits of General Education courses: 3 credits of GN courses; 3 credits of GQ courses; 6 credits of GWS courses.)

PRESCRIBED COURSES (62 credits)
EE T 101(3), EE T 109 (1), EE T 114(4)[1], EE T 117(3)[1], EE T 118(1)[1], EE T 120(1), EG T 101(1), EG T 102(1), E T 002(1), E T 005(1) (Sem: 1-2)
ENGL 015 GWS(3), MATH 081 GQ(3), MATH 082 GQ(3), PHYS 150 GN(3) (Sem: 1-2)
BE T 201(5), BE T 202(4), BE T 204W(4), BE T 205(3) (Sem: 1-2)
BIOL 141 GN(3), CAS 100 GWS(3), CHEM 011(3), MATH 083 GQ(4) (Sem: 1-2)
BE T 203 (4) (Sem: 3-4)

ADDITIONAL COURSE (3 credits)
Select 3 credits from the following technical courses: BE T 297(1-9), BIOL 129 GN(4), CE T 261(3), CMPSC 101 GQ(3), EE T 211(3), EE T 213W(5), EE T 297(1-9), EG T 201(2), MCH T 111(3), or ME T 207(3) (Sem: 1-2)

[1]A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

BUSINESS ADMINISTRATION

Abington College;Altoona College; Berks-Lehigh Valley College; Capital College; Commonwealth College; World Campus

The two-year, college-level academic Business Administration major is designed to provide instruction in business administration that fulfills the requirements of various levels of responsibility higher than that held by high school graduates. This program also is designed to articulate with Pennsylvania Department of Education-approved Tech Prep programs. Secondary school Tech Prep business students who have graduated from a program covered by a signed Penn State Tech Prep Articulation Agreement may be eligible for special admission procedures and/or advanced placement. Contact your local Penn State campus for more information.

The primary objective of this major is to provide a managerially oriented program with sufficient communicative and mathematical skills, socially relevant course work, and options composed of advanced courses in specific business specialties to develop a well-rounded and technically knowledgeable graduate. Five options are available for the student: Accounting, General Business, Information Systems, Management, and Marketing. Not all options are available at every campus.

Graduates of this program may also qualify for admission to baccalaureate degree programs in Business or related fields at all Penn State campuses. It articulates particularly well with the Bachelor of Science in Business degree offered by Abington College, Altoona College, Berks-Lehigh Valley College, and the Commonwealth College.

For the Associate in Science degree in Business Administration, a minimum of 68 credits is required.

GENERAL EDUCATION: 21 credits
(9 credits of these 21 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 56-57 credits
(This includes 3 credits of GQ General Education courses and 6 credits of GWS General Education courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 41-42 credits

PRESCRIBED COURSES (22 credits)
ENGL 015 GWS(3), MATH 021 GQ(3) (Sem: 1-2)
SPCOM 100 GWS(3) (Sem: 1-4)
ACCTG 211(4), B A 243(4), ENGL 202D GWS(3), M I S 204(2) (Sem: 3-4)

ADDITIONAL COURSES (19-20 credits)
ECON 002 GS or ECON 004 GS(3) (Sem: 3-4)
M I S 103(3) or CMPSC 203(4)[75], (Sem: 1-2)
FIN 100(3)[1] or FIN 301(3)[1] (Sem: 3-4)
MGMT 100(3)[1] or MGMT 301(3)[1] (Sem: 3-4)
MKTG 221(3)[1] or MKTG 301(3)[1] (Sem: 3-4)
MS&IS 200(4) or STAT 200 GQ(4) (Sem: 3-4)

REQUIREMENTS FOR THE OPTION: 15 credits
(Not all options are available at every campus.)

ACCOUNTING OPTION: 15 credits
PRESCRIBED COURSES (9 credits)
ACCTG 151(3), ACCTG 152(3), ACCTG 160(3) (Sem: 3-4)

ADDITIONAL COURSES (0-3 credits)
Select 0-3 credits from ACCTG 153(3), ACCTG 170(3), ACCTG 186(3) (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (3-6 credits)
Select 3-6 credits in consultation with your adviser in business or other University-wide offerings that enhance competence in the option (Sem: 1-4)

GENERAL BUSINESS OPTION: 15 credits
SUPPORTING COURSES AND RELATED AREAS (15 credits)
Select 9-12 credits in business courses (Sem: 1-4)
Select 3- 6 credits in consultation with your adviser in business or other University-wide offerings that enhance competence in the option (Sem: 1-4)

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[1]A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
[75]Students who elect CMPSC 203 will complete a minimum of 69 credits.

INFORMATION SYSTEMS OPTION: 15 credits
SUPPORTING COURSES AND RELATED AREAS (15 credits)
Select 3-6 credits in consultation with your adviser in business or other University-wide offerings that enhance competence in the option (Sem: 1-4)
Select 9-12 credits in consultation with your adviser from a list of departmentally approved courses in M I S, IST, or CMPSC (Sem: 3-4)[74]

MANAGEMENT OPTION: 15 credits
ADDITIONAL COURSES (9-12 credits)
Select 9-12 credits from B A 250(3), L I R 100 GS(3), MGMT 150(3), MGMT 321(3), MGMT 341(3), OISM 150(3) (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (3-6 credits)
Select 3-6 credits in consultation with your adviser in business or other University-wide offerings that enhance competence in the option (Sem: 1-4)

MARKETING OPTION: 15 credits
ADDITIONAL COURSES (9-12 credits)
Select 9-12 credits from MKTG 150(3), MKTG 160(3) or MKTG 327(3), MKTG 180(3), MKTG 190(3) or MKTG 342(3), MKTG 220(3), MKTG 310(3) (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (3-6 credits)
Select 3-6 credits in consultation with your adviser in business or other University-wide offerings that enhance competence in the option (Sem: 1-4)

CRIMINAL JUSTICE

Altoona College

Students receiving an associate degree in Criminal Justice should understand each of the three main components of the criminal justice system and their interrelationships. This program includes study in law enforcement, courts, and corrections individually and as components of a system, plus work in theories of crime causation, and crime control policy. Students should expect reading, writing, and critical thinking skills to be rigorously applied and developed throughout the degree program. The Associate in Science degree in Criminal Justice prepares students for entry-level positions in criminal justice or for study at the baccalaureate level.

For the Associate in Science in Criminal Justice, a minimum of 64 credits is required.

GENERAL EDUCATION: 21 credits
(9-13 of these credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

ELECTIVES: 20-24 credits

REQUIREMENTS FOR THE MAJOR: 32 credits[1]
(This includes 9-13 credits of General Education courses: 3 credits of GH courses; 0-4 credits of GQ courses; 6 credits of GS courses.)

PRESCRIBED COURSES (28 credits)
CJ 100(3), M I S 103(3), PHIL 103 GH(3), SOC 007(3), SOC 012 GS(3), SOC 119 GS;DF(4) (Sem: 1-4)
CJ 210(3), CJ 220(3), CJ 230(3) (Sem: 3-4)

ADDITIONAL COURSES (4 credits)
MS&IS 200(4) or STAT 200 GQ(4) (Sem: 3-4)

DIETETIC FOOD SYSTEMS MANAGEMENT

College of Health and Human Development: offered only via World Campus

An associate degree in Dietetic Food Systems Management helps broaden a student's knowledge of food service management and nutrition and allows for the application of that knowledge in a variety of settings, such as hospitals, long-term care facilities, schools, and community programs. The major is designed to provide a foundation in general education and a strong management orientation balanced with technical skills needed in food service management and nutrition care.

Students in the major are required to take a prescribed set of core courses in dietetic food systems

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[1]A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

[74]Students in the IS option to 2 BA may enroll in IST courses on a space available basis only and only on campuses that offer IST courses. IST 210 and IST 220 require IST 110 as a prerequisite, and IST 250 requires IST 110 as a prerequisite or concurrent enrollment.

management and then may choose a specific emphasis by selecting a series of courses in either health care or school food service. Employment in an approved health care facility, community nutrition program, or school nutrition program is required for admission to the major. Graduates with a health care emphasis who were supervised by a registered dietitian in the clinical setting are eligible for active membership in the American Dietetic Association and can become Registered Dietetic Technicians after passing the credentialing examination. Students choosing to emphasize school food service are eligible for certification with the American School Food Service Association.

This major is available only through distance education, but students may complete General Education program requirements through resident instruction.

For the Associate in Science degree in Dietetic Food Systems Management, 60 credits are required.

GENERAL EDUCATION: 21 credits
(6-9 of these 21 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

ELECTIVES: 2-5 credits

REQUIREMENTS FOR THE MAJOR: 43 credits
(This includes 6-9 credits of General Education courses: 3 credits of GWS; 0-3 credits of GN; 3 credits of GS.)

PRESCRIBED COURSES (23 credits)
D S M 101(3)[1], D S M 195(3)[1], D S M 205(3)[1], D S M 250(3)[1], ENGL 015 GWS(3) (Sem: 1-2)
D S M 260(4)[1], D S M 295W(4)[1] (Sem: 3-4)

ADDITIONAL COURSES (20 credits)
Select 3 credits from NUTR 151(3)[1] or NUTR 251 GHA(3)[1] (Sem: 1-2)
Select 3 credits from HD FS 129 GS(3) or SOC 001 GS(3) or PSY 002 GS(3) (Sem: 1-2)
Select from either a or b:
a. Health Care (14 credits)
D S M 100(1)[1], BI SC 004 GN(3) (Sem: 1-2)
NUTR 252(4)[1], NUTR 359(2) [1] (Sem: 3-4)
NUTR 253(3) or D S M 280(3) (Sem: 3-4)
D S M 295A(1) (Sem: 3-4)
b. School Food Service (14 credits)
D S M 105(2)[1], D S M 204(3)[1], D S M 275(3)[1] (Sem: 1-4)
Select 3 credits from HD FS 129 GS(3), HD FS 229 GS(3), HD FS 315 GI(3), or HD FS 315W GI(3) (Sem: 3-4)
Select 3 credits of supporting courses from an approved department list. (Sem: 3-4)

ELECTRICAL ENGINEERING TECHNOLOGY

Altoona College; Commonwealth College (Penn State DuBois, Fayette, Hazleton, New Kensington, Shenango); College of Engineering

This major helps prepare graduates for technical positions in the expanding fields of electronics, computers and microprocessors, instrumentation, and electrical equipment. The primary objective is to provide a broad foundation of theoretical and practical knowledge in the areas of electrical and electronic circuits, digital circuits, computers, electrical machinery, and programmable logic controls. The program also articulates with Pennsylvania Department of Education-approved Tech Prep programs. Secondary students who have graduated from a program covered by a signed Penn State Articulation Agreement may be eligible for special admission procedures and /or advanced placement.

Graduates of the Electrical Engineering Technology major may qualify for admission to the baccalaureate degree majors in Electrical Engineering Technology or Computer Engineering Technology offered at Penn State Harrisburg, Capital College; the baccalaureate degree major in Electrical Engineering Technology at Penn State Erie, The Behrend College; or the baccalaureate degree major in Electro-Mechanical Engineering Technology offered at Altoona College, Berks-Lehigh Valley College, or Penn State New Kensington, Commonwealth College.

For the Associate in Engineering Technology degree in Electrical Engineering Technology, a minimum of 66 credits is required. This program is accredited by the Technology Accreditation Commission of ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202-4012, telephone: 410-347-7700, or **www.abet.org**.

GENERAL EDUCATION: 21 credits
(12 of these 21 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See General Education description in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 57-60 credits
(This includes 12 credits of General Education courses: 3 credits of GN courses; 3 credits of GQ courses; 6 credits of GWS courses.)

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[1]A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

PRESCRIBED COURSES (56 credits)
EE T 101(3), EE T 109(1), EE T 114(4)[1], EE T 117(3)[1], EE T 118(1)[1], EE T 120(1), EG T 101(1), EG T 102(1), ENGL 015 GWS(3), ET 002(1), ET 005 (1), MATH 081 GQ (3), MATH 082 GQ(3) (Sem: 1-2)
CAS 100 GWS(3), EE T 205(1), EE T 210(2), EE T 211(3), EE T 213W(5), EE T 216(3), EE T 221(1), EE T 220(2), MATH 083 GQ(4), PHYS 150 GN(3), PHYS 151(3) (Sem: 3-4)

ADDITIONAL COURSES (1-4 credits)
Select 1-4 credits from the following technical courses: BI SC 003 GN(3), CHEM 011(3), CHEM 012 GN(3), CE T 261(3), CMPSC 101 GQ(3), CMPSC 201C GQ(3) or CMPSC 201F GQ(3), EE T 297(1-9), IE T 101(3), IE T 105(2), MATH 140 GQ(4), MATH 141 GQ(4), MCH T 111(3) (Sem: 3-4)

FOREST TECHNOLOGY

College of Agricultural Sciences; Commonwealth College (Penn State Mont Alto)

The objectives of the major are to train forestry field personnel in the technical aspects of evaluating, managing, and protecting forest resources. Laboratories held in the Michaux State Forest, adjacent to Penn State Mont Alto, stress field applications of classroom theory. Both written and oral communication skills are stressed in all courses. Graduates of the program are employed by private businesses including forestry consulting firms, sawmills, and other wood products manufacturers; public agencies including federal, state, and municipal forest resource management and recreation programs; urban tree service companies, pulp and paper manufacturers, surveying firms and landscaping firms, utility companies, and other businesses requiring personnel skilled in field inventory procedures, analysis, and presentation.

Some graduates transfer their credits to bachelor's degree programs such as forest science, wildlife and fisheries science, recreation and parks management, wood products, environmental resource management, soil science, biology, and business management.

For the Associate in Science degree in Forest Technology, a minimum of 67 credits is required.

GENERAL EDUCATION: 21 credits
(See description of General Education in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 46 credits

PRESCRIBED COURSES (40 credits)
FORT 100(1), FORT 105(3)[1], FORT 120(2), FORT 150(3)[1] (Sem: 1)
FORT 110(3)[1], FORT 130(2), FORT 140(3), FORT 160(3)[1] (Sem: 2)
FORT 170(3), FORT 175(1) (Sem: Summer)
FORT 200(1), FORT 220(4), FORT 230(2), MGMT 100W(3) (Sem: 3)
FORT 240(3), FORT 250(3) (Sem: 4)

ADDITIONAL COURSES (6 credits)
Select 6 credits from FORT 210(3), WILDL 101(3), or WILDL 207(3) (Sem: 3-4)

NOTE: BIOL 110(4), CHEM 012(3), and MATH 110(4) are recommended for students planning to continue in the Forest Science baccalaureate program.

GENERAL BUSINESS

Penn State Erie, The Behrend College

The associate degree major in General Business provides an opportunity for students to earn an associate degree which gives them a general introduction to several aspects of business. In addition, it provides a foundation that allows those students who qualify for admission to baccalaureate degree programs in business to make a smooth transition into four-year majors offered at Penn State Erie, The Behrend College, and Penn State Harrisburg, The Capital College. The business course work required by the major introduces students to basics of accounting; economics; management information systems; quantitative business analysis; and the social, legal, ethical and political environments within which businesses operate. The general education and other requirements of the major provide an opportunity for students to strengthen their skills in oral and written communication and quantitative reasoning which are essential for success in business careers. To develop a well-rounded graduate, students select supporting courses from those approved for General Education.

For the Associate in Science degree in General Business, a minimum of 60 credits is required.

GENERAL EDUCATION: 21 credits
(12 of these 21 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

[1]A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

REQUIREMENTS FOR THE MAJOR: 51-52 credits
(This includes 12 credits of General Education courses: 3 credits of GWS courses; 3 credits of GQ courses; 6 credits of GS courses.)

PRESCRIBED COURSES (33 credits)
CMPSC 203 GQ(4), ENGL 015 GWS(3) (Sem: 1-2)
ACCTG 211(4)[1], B A 243(4), CAS 100 GWS(3), ECON 002 GS(3), ECON 004 GS(3), ENGL 202D GWS(3), M I S 204(2)[1], MS&IS 200(4)[1] (Sem: 2-4)

ADDITIONAL COURSES (3-4 credits)
MATH 021 GQ(3), MATH 022 GQ(3), or MATH 110 GQ(4) (Sem: 1-2)

SUPPORTING COURSES AND RELATED AREAS (15 credits)
Select 15 credits from courses approved for General Education, including 6 credits in the natural sciences (GN), 3 credits in the arts (GA), and 3 credits in the humanities (GH) (Sem: 1-4)

HOTEL, RESTAURANT, AND INSTITUTIONAL MANAGEMENT

Berks-Lehigh Valley College (Penn State Berks); College of Health and Human Development; World Campus
The Hotel, Restaurant, and Institutional Management major is an intensive four-semester major designed to prepare students for managerial positions in the hospitality industry. The course of study places heavy reliance on experience acquired in an on-the-job setting.

Students who achieve outstanding records may, upon completing this program, apply for admission to the baccalaureate degree major in Hotel, Restaurant, and Institutional Management in the College of Health and Human Development. Six or more additional semesters of satisfactory work are required to earn the baccalaureate degree. Graduates of this major may qualify for admission to other baccalaureate degree majors.

For the Associate in Science degree in Hotel, Restaurant, and Institutional Management, a minimum of 64 credits is required.

GENERAL EDUCATION: 21 credits
(6 of these 21 credits are included in REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 49-51 credits
(This includes 6 credits of General Education GWS courses.)

PRESCRIBED COURSES (34 credits)
D S M 101 (3), ENGL 015 GWS(3)[70], ENGL 202D GWS(3)[70], HRIM 201(3)[70], HRIM 250(4)[1], HRIM 270(4)[1], HRIM 295(2), HRIM 305(3)[70], HRIM 310(3)[70], HRIM 319(3)[70], HRIM 380(3)[70] (Sem: 1-4)

ADDITIONAL COURSES (9-11 credits)
HRIM 204(3) or MKTG 221(3)[70] (Sem: 1-4)
HRIM 260W(4) or MGMT 341(3) (Sem: 1-4)
ACCTG 211(4) or HRIM 335(3)[70] (Sem: 1-4)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 3 credits in nutrition (Sem: 1-4)
Select 3 credits in consultation with adviser to develop more depth in hospitality management (Sem: 1-4)

HUMAN DEVELOPMENT AND FAMILY STUDIES

Altoona College; Capital College; Commonwealth College: Delaware County, DuBois, Fayette, Hazleton, Mont Alto, Shenango, Worthington Scranton, York; College of Health and Human Development; World Campus
For more information, contact: Mary Jo Spicer, S-120 Henderson Building, University Park campus
This major integrates practical and academic experiences to provide the student with entry-level professional competence in the human service field. The objective of the major is to offer a general education background, a knowledge base in life span and family development, and a core of professional skills that may be applied in program planning and service delivery activities. The major is offered part-time, in the evening, and through independent learning.
ADULT DEVELOPMENT AND AGING SERVICES OPTION: This option is designed to prepare students for a wide variety of service roles in mental health facilities, nursing homes and other institutions for the aged, area agencies on aging, public welfare and family service agencies, women's resource centers, human relations programs, employee assistance programs, and customer services and consumer relations programs in business and industry. An improved field experience in any of a wide variety of settings that serve adults, the aged, and their families, is required for this option.

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[1]A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
[70] These courses are required for the baccalaureate degree in Hotel, Restaurant, and Institutional Management.

CHILDREN, YOUTH, AND FAMILY SERVICES OPTION: This option is designed to prepare students for service roles in preschools; day care centers; hospitals; institutional and community programs for emotionally disturbed, abused, or neglected children and adolescents; as well as a variety of public welfare and family service agencies. An approved field experience in a children, youth, or family services setting is required for this option.

For the Associate in Science degree in Human Development and Family Studies, a minimum of 60 credits is required.

GENERAL EDUCATION: 21 credits
(15 of these 21 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

ELECTIVES: 0-3 credits

REQUIREMENTS FOR THE MAJOR: 51-55 credits
(This includes 15 credits of General Education courses: 6 credits of GWS courses; 3 credits of GS courses; 3 credits of GN courses; and 3 credits of GQ courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 30-31 credits

PRESCRIBED COURSES (21 credits)
CAS 100 GWS(3), ENGL 015 GWS(3), HD FS 129 GS(3)[1], HD FS 301(3)[1], PSY 002 GS(3) (Sem: 1-2)
HD FS 395(6) (Sem: 3-4)

ADDITIONAL COURSES (9-10 credits)
EDPSY 101 GQ(3)[1], STAT 100 GQ(3)[1], or STAT 200 GQ(4)[1] (Sem: 1-2)
HD FS 315 DF(3)[1] or SOC 030 GS(3) (Sem: 3-4)
BIOL 141 GN(3), BIOL 055 GN(3), or BI SC 004 GN(3) (Sem: 3-4)

REQUIREMENTS FOR THE OPTION: 21-24 credits

ADULT DEVELOPMENT AND AGING SERVICES OPTION: 21 credits
PRESCRIBED COURSES (6 credits)
HD FS 249GS(3)[1], HD FS 311(3)[1] (Sem: 1-4)

ADDITIONAL COURSES (6 credits)
Select 6 credits from HD FS 312W(3)[1], H P A 101 GS(3), KINES 060 GHS(3), NUTR 251 GHA(3), RPM 277 DF(3) (Sem: 1-4)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 9 credits in consultation with the adviser from University-wide offerings that enhance competence in the option (Sem: 3-4)

CHILDREN, YOUTH, AND FAMILY SERVICES OPTION: 24 credits
PRESCRIBED COURSES (9 credits)
HD FS 229 GS(3)[1], HD FS 239 GS(3)[1], HD FS 311(3)[1] (Sem: 1-4)

ADDITIONAL COURSES (6 credits)
Select 6 credits from HD FS 312W[1], H P A 101 GS(3), KINES 060 GHS(3), NUTR 251 GHA(3), RPM 277 DF(3) (Sem: 1-4)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 9 credits in consultation with the adviser from University-wide offerings that enhance competence in the option (Sem: 3-4)

INFORMATION SCIENCES AND TECHNOLOGY

Altoona College; Berks-Lehigh Valley College; Capital College; Commonwealth College; School of Information Sciences and Technology

This associate degree major is structured to prepare graduates for immediate and continuing employment opportunities in the broad disciplines of information science and technology. This includes positions such as application programmers, associate systems designers, network managers, Web designers and administrators, or information systems support specialists. Specifically, the major is designed to ensure a thorough knowledge of information systems and includes extensive practice using contemporary technologies in the creation, organization, storage, analysis, evaluation, communication, and transmission of information. The major fosters

[1]A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

communications, interpersonal, and group interaction skills through appropriate collaborative and active learning projects and experiences. Technical material covers the structure of database systems, Web and multimedia systems, and considerations in the design of information systems. Team projects in most courses, a required internship, and a second-year capstone experience provide additional, focused venues for involving students in the cutting-edge issues and technologies in the field.

The Associate of Science in IST degree will be offered at multiple campuses within the Penn State system of colleges and campuses. Note that not all options will be available at all locations.

BACCALAUREATE OPTION: This option provides maximum articulation with the baccalaureate degree. Students who complete this option will meet all lower-division requirements for the baccalaureate degree. This is not the case with the remaining options, although the degree of articulation is quite high for all associate degree options.
GENERALIZED BUSINESS OPTION: This option enables students to specialize in the general business areas of accounting, marketing, and management.
INDIVIDUALIZED OPTION: This option enables students to work closely with an adviser to develop a plan of study that meets the dual objectives of allowing a flexible academic program and providing breadth of technical specialization. An example would be a program where a student would take some of the courses listed in the Web Administration option and the remainder in the Software option.
SOFTWARE OPTION: This option prepares graduates for entry-level programming support positions in industry. Students take courses in Web programming, database programming, and other contemporary programming environments.
WEB ADMINISTRATION OPTION: This prepares graduates for positions as Web administrators and Web programmers.
NETWORKING OPTION: This option prepares graduates for positions as entry-level computer network administrators. Students take courses in personal computer hardware, networking essentials, and network administration.
DATA/INFORMATION OPTION: This option prepares graduates for entry-level database support positions. Students take courses in relational database systems and database management.
INDUSTRIAL/MANUFACTURING OPTION: This option prepares graduates for entry-level manufacturing information systems positions. Students take courses in electrical and mechanical systems, and business and industrial processes.
TELECOMMUNICATIONS OPTION: This option prepares graduates for entry-level positions in the telecommunications industry. Students take courses in voice and data communications, protocols, networks, and wireless systems.

For the Associate in Science degree in IST, a minimum of 60 credits is required.

GENERAL EDUCATION: 21 credits
(9-12 of these 21 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See the description of General Education in front of Bulletin.)

ELECTIVES: 2-6 credits

REQUIREMENTS FOR THE MAJOR: 45-47 credits
(This includes 9-12 credits of General Education courses, i.e., ALL options: 3 credits of GQ courses; 6 credits of GWS courses. The Baccalaureate option also includes 3 credits of GS courses to equal a total of 12 credits that double count; the General Business option also includes 0-3 credits of GS courses to equal 9-12 credits that double count.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 30 credits

PRESCRIBED COURSES (26 credits)
CMPSC 101 GQ(3)[1] (Sem: 1-2)
CAS 100B GWS(3), IST 110(4)[1], IST 111S(1), IST 210(3)[1], IST 220(3)[1], IST 250(3), ENGL 015 GWS(3) (Sem: 1-2)
IST 260W(3) (Sem: 3-4)

ADDITIONAL COURSES (4 credits)
ENGL 202C GWS(3) or ENGL 202D GWS(3) (Sem: 3-4)
IST 295A(1) or IST 295B(1) (Sem: 3-4)

REQUIREMENTS FOR THE OPTION: 15-18 credits

BACCALAUREATE OPTION: 17-18 credits
PRESCRIBED COURSES (13 credits)
IST 230(3) and IST 240(3) (Sem: 3-4)

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[1]A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

ECON 002 GS(3) (Sem: 3-4)
STAT 200 GQ(4) (Sem: 3-4)

ADDITIONAL COURSES (4 credits)
MATH 110 GQ(4) or MATH 140 GQ(4) (Sem: 1-2)

GENERALIZED BUSINESS OPTION: 15-16 credits
ADDITIONAL COURSES (15-16 credits)
Select 15 credits in consultation with the adviser from the following list: (Sem:1-4)
ACCTG 151(3), ACCTG 152(3), ACCTG 153(3), ACCTG 160(3), ACCTG 170(3), ACCTG 186(3), ACCTG 211(4), B A 250(3), MKTG 150(3), MKTG 180(3), MKTG 190(3), MKTG 220(3), MKTG 221(3), MKTG 310(3), MKTG 327(3), MGMT 100(3), MGMT 150(3), MGMT 321(3), MGMT 341(3)
ECON 002 GS(3), ECON 004 GS(3), or ECON 014 GS(3)
MATH 017 GQ(3), MATH 021 GQ(3), MATH 022 GQ(3), or MATH 026 GQ(3)

INDIVIDUALIZED OPTION: 15 credits
SUPPORTING COURSES AND RELATED AREAS (15 credits)
Select 15 credits in consultation with an adviser that follow a coherent theme in information sciences and technology. (Sem: 1-4)

SOFTWARE OPTION: 15 credits
PRESCRIBED COURSES (12 credits)
CMPBD 205(3) (Sem: 2-4)
IST 211(3), IST 247(3), and IST 256(3) (Sem: 3-4)

ADDITIONAL COURSES (3 credits)
MATH 017 GQ(3), MATH 021 GQ(3), MATH 022 GQ(3), or MATH 026 GQ(3) (Sem: 1-2)

NETWORKING OPTION: 15 credits
PRESCRIBED COURSES (12 credits)
IST 225(3), IST 226(3), IST 227(3), and IST 228(3) (Sem: 3-4)

ADDITIONAL COURSES (3 credits)
MATH 017 GQ(3), MATH 021 GQ(3), MATH 022 GQ(3), or MATH 026 GQ(3) (Sem: 1-2)

WEB ADMINISTRATION OPTION: 15 credits
PRESCRIBED COURSES (12 credits)
IST 255(3), IST 256(3), IST 257(3), and IST 258(3) (Sem: 3-4)

ADDITIONAL COURSES (3 credits)
MATH 017 GQ(3), MATH 021 GQ(3), MATH 022 GQ(3), or MATH 026 GQ(3) (Sem: 1-2)

MANUFACTURING OPTION: 16 credits
PRESCRIBED COURSES (12 credits)
IST 271(3), IST 272(3), IST 273(3), and IST 274(3) (Sem: 3-4)
ADDITIONAL COURSES (4 credits)
MATH 110(4) or MATH 140(4) (Sem: 1-2)

TELECOMMUNICATIONS OPTION: 15 credits
PRESCRIBED COURSES (12 credits)
IST 221(3), IST 222(3), IST 223(3), and IST 224(3) (Sem: 3-4)

ADDITIONAL COURSES (3 credits)
MATH 017 GQ(3), MATH 021 GQ(3), MATH 022 GQ(3), or MATH 026 GQ(3) (Sem: 1-2)

DATA/INFORMATION OPTION: 15 credits
PRESCRIBED COURSES (12 credits)
IST 211(3), IST 212(3), IST 213(3), and IST 214(3) (Sem: 3-4)

ADDITIONAL COURSES (3 credits)
MATH 017 GQ(3), MATH 021 GQ(3), MATH 022 GQ(3), or MATH 026 GQ(3) (Sem: 1-2)

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[1]A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

LETTERS, ARTS, AND SCIENCES

Abington College; Altoona College; Penn State Erie, The Behrend College; Berks-Lehigh Valley College; Capital College; Commonwealth College; College of the Liberal Arts; World Campus

The objectives of the Letters, Arts, and Sciences major are to broaden the student's understanding, interests, and skills; to help the student become a more responsible, productive member of the family and community; and to offer a degree program with sufficient electives to permit some specialization according to the student's interests or career plans. Letters, Arts, and Sciences is a complete two-year degree major. However, graduates who later seek admission to baccalaureate degree majors may apply baccalaureate credits toward the new degree.

In addition to a wide variety of baccalaureate majors offered at University Park campus, graduates of the Letters, Arts, and Sciences major may qualify for admission to the baccalaureate degree majors in Behavioral Sciences, Elementary Education, Humanities, or Public Policy offered at Penn State Harrisburg. Or they may qualify for any of a large number of baccalaureate degree majors offered by Penn State Erie, The Behrend College, in business, the liberal arts, and sciences.

For the Associate in Arts degree in Letters, Arts, and Sciences, a minimum of 60 credits is required.

GENERAL EDUCATION: 21 credits
(6 of these 21 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

ELECTIVES: 15 credits

REQUIREMENTS FOR THE MAJOR: 30 credits#[1]
(This includes 6 credits of General Education GWS courses.)

PRESCRIBED COURSES (6 credits)
ENGL 015 GWS(3) (Sem: 1-2)
CAS 100 GWS(3) (Sem: 3-4)

ADDITIONAL COURSE (3 credits)
ENGL 202A GWS(3), ENGL 202B GWS(3), ENGL 202C GWS(3), or ENGL 202D GWS(3) (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (21 credits)
Select 3 credits in any course designated as arts* (Sem: 1-4)
Select 3 credits in any course designated as humanities* (Sem: 1-4)
Select 3 credits in any course designated as social and behavioral sciences* (Sem: 1-4)
Select 3 credits in any course designated as physical, biological, or earth sciences* (Sem: 1-4)
Select 9 credits in any one of the following areas*: arts, humanities, social and behavioral sciences, natural sciences and quantification, and foreign language skills. (If foreign language courses are chosen, it is recommended that these courses be in one foreign language sequence.) (Sem: 1-4)

MANUFACTURING TECHNOLOGY

Commonwealth College; Penn State Erie, The Behrend College

This major is designed to prepare graduates for careers in the manufacturing industry. The program of study includes courses in applied materials, mechanics, manufacturing processes, quality control, computer-aided modeling, technical communications and a concentration in a manufacturing area.

Graduates of this major may qualify for admission to one of the baccalaureate degree majors in Engineering Technology offered in the Penn State system. The number of credits applied to the baccalaureate degree will depend upon the degree requirements.

For the Associate in Science degree in Manufacturing Technology, a minimum of 66 credits is required.

GENERAL EDUCATION: 21 credits
(9 of these credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 66 credits
(This includes 9 credits of General Education courses: 6 credits of GWS; 3 credits of GQ.)

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[1]A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

#The required credits of General Education and Requirements for the Major must be baccalaureate-level courses. For students intending to seek admission to a baccalaureate program upon graduation, it is recommended that most, if not all, of the courses be at the baccalaureate level. For those students who will seek a bachelor of arts degree upon graduation from Letters, Arts, and Sciences, it is strongly recommended that a foreign language be taken since admission to a bachelor of arts program in the College of the Liberal Arts requires one college-level course, or the equivalent, in a foreign language.

*Courses will satisfy the arts, humanities, social and behavioral sciences, natural sciences, and quantification requirements are defined on the Letters, Arts, and Sciences checksheet, which may be obtained from the College of the Liberal Arts associate dean for undergraduate studies at the University Park campus or from any Letters, Arts, and Sciences representative at other locations.

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 30 credits

PRESCRIBED COURSES (15 credits)
ENGL 015 GWS(3), IE T 101(3)[1] (Sem: 1-2)
CAS 100 GWS(3), IE T 109(3)[1], MCH T 111(3)[1] (Sem: 3-4)

ADDITIONAL COURSES (15 credits)
EG T 101(1), EG T 102(1), EG T 114(2), EG T 201(2), or METBD 110(3), METBD 111(3) (Sem: 1-4)
METBD 050(3)[1] or CMPSC 110(3)[1] (Sem: 1-2)
MATH 021 GQ(3)[1], MATH 026 GQ(3)[1], or MATH 081 GQ(3)[1], MATH 082 GQ(3)[1]

REQUIREMENTS FOR THE OPTION: 24 credits

GENERAL MANUFACTURING OPTION: 24 credits
PRESCRIBED COURSES (4 credits)
IE T 215(2), IE T 216(2) (Sem: 3-4)

ADDITIONAL COURSES (20 credits)
Select 20 credits from school-approved list (Sem: 1-4)

PLASTICS OPTION: 24 credits
PRESCRIBED COURSES (10 credits)
MFTBD 060(3), MFTBD 061(4), MFTBD 062(3) (Sem: 1-2)

ADDITIONAL COURSES (14 credits)
Select 6 credits of plastics courses from school-approved list (Sem: 1-4)
Select 8 credits of technical courses from school-approved list (Sem: 1-4)

MATERIALS ENGINEERING TECHNOLOGY (2MATE)

Commonwealth College (Penn State DuBois)

The curriculum of the program provides students with an introduction to the range of practical skills needed to be an engineering technician in materials-related industries. The program emphasizes powdered metal technology, but the student is prepared for entry-level positions in other materials-related industries.

Among the responsibilities of a materials technician are carrying out hardness, tensile, compression or nondestructive tests, or special problem-solving projects that require failure analysis. Other duties may entail preparing or examining samples under a microscope, using materials specifications or blueprints, or working out heat-treating procedures.

The primary goal of the program is achieved through a core of materials topics, including structure and properties of engineering materials, materials testing, powder metallurgy, and structure characterization. The technical courses are supported by foundation courses in written and oral communications, technical mathematics and calculus, chemistry, physics, computer-aided drafting (CAD), and basic engineering topics. This program is one of the Pennsylvania Department of Education-approved Tech Prep programs. Secondary school students who have graduated from a program covered by a signed Penn State Articulation Agreement may be eligible for special admission procedures and/or advanced placement.

For the Associate in Engineering Technology degree in Materials Engineering Technology, a minimum of 64 credits is required.

GENERAL EDUCATION: 21 credits
(12 of these 21 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 55 credits
(This includes 12 credits of General Education courses: 6 credits of GWS courses; 3 credits of GN courses; 3 credits of GQ courses.)

PRESCRIBED COURSES (49 credits)
CAS 100 GWS(3), CHEM 012 GN(3), CHEM 014 GN(1), EE T 101(3), EE T 109(1), EG T 101(1), EG T 102(1), ENGL 015 GWS(3), ET 002(1), MATH 081 GQ(3), MATH 082 GQ(3), PHYS 150 GN(3) (Sem: 1-2)
IE T 109(3), MAE T 201(3)[1], MAE T 202(3)[1], MAE T 203(3)[1], MAE T 204W(3), MAE T 205(4)[1], MATH 083 GQ(4)[1] (Sem: 3-4)
ADDITIONAL COURSES (6 credits)
Select 6 credits from the following technical courses: EGT 114(2), EGT 201(2), EGT 297(2), MCH T 111(3), MCH T 213(3), MCH T 214(1), MAE T 297(3) (Sem: 3-4)

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[1]A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

MECHANICAL ENGINEERING TECHNOLOGY

Altoona College; Berks-Lehigh Valley College; College of Engineering

This major helps graduates prepare for technical positions in manufacturing, machine and tool design, computer drafting and design, computer-integrated manufacturing, materials selection and processes, technical sales, and other related industries in mechanical applications. The primary objective of the program is to provide a broad foundation in mechanical systems and applications; computer systems in drafting (CAD), manufacturing (CAM), and automation and robotics (CIM); production and product design; mechanics, dynamics, and strength of materials. This program also articulates with Pennsylvania Department of Education-approved Tech Prep programs. Secondary students who have graduated from a program covered by a signed Penn State Articulation Agreement may be eligible for special admission procedures and/or advanced placement.

Graduates of this major may qualify for admission to the baccalaureate degree majors in Mechanical Engineering Technology and Structural Design and Construction Engineering Technology programs at Penn State Harrisburg; the Mechanical Engineering Technology and the Plastics Engineering Technology programs at Penn State Erie, The Behrend College; or the baccalaureate degree major in Electro-Mechanical Engineering Technology offered at Penn State Altoona, Penn State Berks-Lehigh Valley or Penn State New Kensington.

For the Associate in Engineering Technology degree in Mechanical Engineering Technology, a minimum of 67 credits is required. This program is accredited by the Technology Accreditation Commission of ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202-4012, telephone: 410-347-7700, or **www.abet.org**.

GENERAL EDUCATION: 21 credits
(12 of these 21 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 58-60 credits
(This includes 12 credits of General Education courses: 3 credits of GN courses; 3 credits of GQ courses; 6 credits of GWS courses.)

PRESCRIBED COURSES (53 credits)
EE T 101(3), EE T 109(1), ENGL 015 GWS(3), EG T 101(1), EG T 102(1), EG T 114(2), IE T 101(3)[1], MATH 081 GQ(3), MATH 082 GQ(3), ET 002(1), MCH T 111(3)[1], PHYS 150 GN(3) (Sem: 1-2)
CAS 100 GWS(3), EG T 201(2), IE T 215(2), IE T 216(2), MATH 083 GQ(4), MCH T 213(3), MCH T 214(1), ME T 206(3)[1], ME T 210W(3), PHYS 151(3) (Sem: 3-4)

ADDITIONAL COURSES (5-7 credits)
Select 5-7 credits from the following technical courses: AE T 297(1-9), CE T 261(3), CE T 297(1-9), CHEM 011(3), CHEM 012 GN(3), CHEM 014 GN(1), CMPSC 101 GQ(3), EE T 100(3), EE T 114(4), EE T 118(1), EG T 297(1-9), IE T 105(2), IE T 109(3), IE T 297(1-9), ME T 207(3), ME T 281(4), ME T 297(1-9), or SUR 111(3) (Sem: 3-4)

MEDICAL LABORATORY TECHNOLOGY

Commonwealth College (Penn State Hazleton)

This two-calendar-year Medical Laboratory Technology major (four semesters, two summer sessions) is designed to provide the necessary general and technical training for hospital personnel between the level of the medical laboratory technician (certificate program) and the medical technologist (baccalaureate program). The course of study includes one year of intensive clinical experience at an affiliated hospital and the theoretical background necessary for the clinical procedures performed by the certified medical laboratory technician (associate degree program). Upon completion of program requirements, the student receives the associate degree and is eligible to sit for examinations leading to certification and registry as a medical laboratory technician.

Graduates of the Medical Laboratory Technology major may qualify for admission to the baccalaureate degree majors in Behavioral Sciences, Humanities, or Public Policy offered at Penn State Harrisburg.

For the Associate in Science degree in Medical Laboratory Technology, a minimum of 70 credits is required. (Scheduling of courses in summer session depends on campus location.)

GENERAL EDUCATION: 21 credits
(12 of the 21 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 61-64 credits
(This includes 12 credits of General Education courses: 3 credits of GWS courses; 6 credits of GN courses; 3 credits of GQ courses.)
PRESCRIBED COURSES (53 credits)
BIOL 141 GN(3), BIOL 142(1), CHEM 012 GN(3), CHEM 014 GN(1), MICRB 201(3), MICRB 202(2) (Sem: 1-2)
ENGL 015 GWS(3), MICRB 150(4), CHEM 034(3) (Sem: 1-2, Summer)

[1]A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

CAS 100 GWS(3) (Sem: Summer)
MICRB 151A(7)[1], MICRB 151C(6)[1], MICRB 151D(4)[1], MICRB 151E(2)[1], MICRB 151F(2)[1], MICRB 151W(6)[1] (Sem: 3-4)

ADDITIONAL COURSES (8-11 credits)
BIOL 011 GN(3), BIOL 012 GN(1); or BIOL 110 GN(4) (Sem: 1-2)
CMPSC 001(1) or CMPSC 100(3) (Sem: Summer)
MATH 021 GQ(3) or higher-numbered MATH course, except MATH 035, MATH 036, and MATH 200; or STAT 200 GQ(4); or STAT 250 GQ(3) (Sem: 1-2)

NANOFABRICATION MANUFACTURING TECHNOLOGY

Commonwealth College (Penn State Fayette, Hazleton, Wilkes-Barre, York)

This degree helps graduates prepare for technical positions in the expanding fields of nanofabrication technology or professional nanomanufacturing technology, biotechnology, and/or work in biomedical industries (bionanofabrication). There are two options provided; both require a capstone semester to be taken at the NMT Facility at the University Park campus where students take six ESci courses (3 credits each) of instruction for a total of 18 credits.

NANOMANUFACTURING ENGINEERING TECHNOLOGY OPTION: This option helps prepare graduates for technical positions in the field of nanofabrication technology. The primary objective is to provide a broad foundation of theoretical and practical knowledge in the areas of nanofabrication manufacturing, electrical and electronic circuits, digital circuits, nanofabrication manufacturing equipment, processing and testing. The program will also articulate with Pennsylvania Department of Education-approved Tech Prep programs. Secondary students who have graduated from a program covered by an assigned Penn State Articulation Agreement may be eligible for special admission procedures and/or advanced placement.

NANOMANUFACTURING SCIENCE OPTION: The Nanofabrication Science option is designed to provide for the basic educational needs of students who want to pursue professional programs in nanomanufacturing technology fields primarily in the biotech and biomedical industries (bionanofabrication). The program provides a fundamental group of science courses and a comprehensive group of nanomanufacturing technology courses to those who wish to pursue employment opportunities where such knowledge is necessary or desirable. The program offers a pathway for students to obtain jobs in new and exciting fields, as well as older, established disciplines that are upgrading with this new and emerging technology. Graduates of the program may qualify for admission to the baccalaureate degrees in science. Students who plan to continue in baccalaureate degrees are encouraged to work closely with their advisers.

For the Associate in Engineering Technology degree in Nanofabrication Manufacturing Technology, a minimum of 66-70 credits is required.

GENERAL EDUCATION: 21 credits
(12-15 of these 21 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See General Education description in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 60-66 credits
(This includes 12-15 credits of General Education courses: Nanomanufacturing Engineering Technology option —3 credits of GN courses; 3 credits of GQ courses; 3 credits of GWS courses; 3 credits of GQ, GWS, or GN courses; Nanomanufacturing Science Technology option—3 credits of GN courses; 3 credits of GQ courses; 3 credits of GWS courses; 3 credits of GH courses; 3 credits of GQ, GWS, GH, or GN courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 31 credits

PRESCRIBED COURSES (31 credits)
ENGL 015 GWS(3)[1] (Sem: 1-2)
CAS 100 GWS(3)[1], CHEM 012 GN(3)[1], CHEM 014 GN(1)[1], NMT 210W(3) (Sem: 3-4)
E SC 211(3), E SC 212(3), E SC 213(3), E SC 214(3), E SC 215(3), E SC 216(3) (Sem: 4)

REQUIREMENTS FOR THE OPTION: 29-35 credits

NANOMANUFACTURING ENGINEERING TECHNOLOGY OPTION: 30 credits
PRESCRIBED COURSES (27 credits)
EE T 101(3), EE T 109(l), EE T 114(4), EE T 117(3)[1], EE T 118(l)[1], EE T 120(l), MATH 081 GQ(3), MATH 082 GQ(3) (Sem: 1-2)
EMET 350(l), PHYS 150 GN(3), STAT 200 GQ(4) (Sem: 3-4)
ADDITIONAL COURSES (3 credits)
ED&G 100(3) or ET 002(1), EG T 101(1), and EG T 102(1) (Sem: 1-2)

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NANOMANUFACTURING SCIENCE OPTION: 29-35 credits
ADDITIONAL COURSES (29-35 credits)
BIOL 110 GN(4)[1] or BIOL 141 GN(3)[1] (Sem: 1-4)
EE T 101(3) and EE T 109(l) or E E 210(4) (Sem: 1-4)
Note: PHYS 250 and PHYS 251 or PHYS 211 and PHYS 212 and MATH 140 are recommended for students planning to continue in baccalaureate programs of science.
Select 4-6 credits from MATH 022 GQ(3) and MATH 026 GQ(3), or MATH 040 GQ(5), or MATH 140 GQ(4) (Sem: 1-2)
Select 3-4 credits from STAT 200 GQ(4), STAT 220(3), STAT 250 GQ(3) (Sem: 1-4)
Select 3 credits from PHIL 002 GH(3), PHIL 103 GH(3), PHIL 103W GH(3), PHIL 110 GH(3), PHIL 118 GH(3), PHIL 221 GH(3) (Sem: 1-4)
Select 3 credits from CMPSC 100(3), CMPSC 101 GQ(3), M I S 103(3) (Sem: 1-4)
Select 6-8 credits from PHYS 150 GN(3) and PHYS 151 GN(3) or PHYS 250 GN(4) and PHYS 251 GN(4) or PHYS 211 (4) and PHYS 212 (4) (Sem: 2-4)
Select 3 credits from BIOL 222(3), CHEM 013 GN(3), CHEM 034(3), CSE 271(3), or ED&G 100(3) (Sem: 2-4)

NURSING

Altoona College; Commonwealth College (Penn State Fayette, Mont Alto, Worthington Scranton); College of Health and Human Development

This major helps graduates prepare for employment primarily in hospitals and long-term care facilities. Graduates provide nursing care to individuals with commonly occurring acute or chronic health problems. After earning the associate degree, students are eligible to take the registered nurse examination for licensure by the State Board of Nursing. The major in Nursing is accredited by The National League for Nursing Accrediting Commission (NLNAC), 61 Broadway, New York, NY 10006, telephone 212-363-5555, and approved by the Pennsylvania State Board of Nursing.

Students must carry liability insurance and have an annual health examination. Students are also responsible for their own transportation to clinical settings. The use of a car may be necessary.

Graduates of this major may qualify for admission to the baccalaureate degree program in Nursing.

For the Associate in Science degree in Nursing, a minimum of 68 credits is required.

GENERAL EDUCATION: 21 credits
(15 of these 21 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 62 credits[1]
(This includes 15 credits of General Education courses: 3 credits of GN courses; 3 credits of GQ courses; 6 credits of GS courses; 3 credits of GWS courses)

PRESCRIBED COURSES (59 credits)
BIOL 129 GN(4), BIOL 141 GN(3), BIOL 142(1), ENGL 015 GWS(3), HD FS 129 GS(3), PSY 002 GS(3), SOC 001 GS(3), NURS 101(8), NURS 102(8) (Sem: 1-2)
MICRB 106 GN(3), MICRB 107 GN(1), NURS 201(9), NURS 202W(10) (Sem: 3-4)

ADDITIONAL COURSES (3 credits)
Select 3 credits from MATH 021 GQ or above (Sem: 3-4)

OCCUPATIONAL THERAPY

Berks-Lehigh Valley College; Commonwealth College (Penn State DuBois, Mont Alto)

This major helps graduates prepare to be occupational therapy assistants who are qualified to be employed by agencies that provide occupational therapy and related services. The goal of occupational therapy is to enable the client to be as independent as possible in the daily performance of self-care, productive, and leisure occupations. General education, basic science, and occupational therapy courses are followed by supervised field experience. Upon successful graduation from the program, students must sit for and successfully pass the NBCOT national certification examination to practice. Most states also require licensure as a condition for employment.

To enter this major, students must have a high school diploma or its equivalent. To be admitted to degree candidacy, the applicant must have completed educational background requirements called Carnegie Units or Secondary School Units. Students are responsible for proof of liability insurance and other requirements specified by the facility providing supervised field experience.

The size of each entering class is limited so that optimal clinical experiences and practical application situations can be maintained. Students enter the program only during the fall semester and are expected to progress through the program in the prescribed manner. Fieldwork affiliations are maintained over a wide geographical area. Students may be required to make special housing and transportation arrangements during the fieldwork phase. Students must complete all Level II fieldwork within twenty-four months of successful

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completion of OTA didactic course work.

The Occupational Therapy program is fully accredited by ACOTE, which can be reached at: Accreditation Council for Occupational Therapy Education, P. O. Box 31220, Bethesda, MD 20824-1220; telephone, 301-652-2682.

For the Associate in Science degree in Occupational Therapy, a minimum of 64 credits is required.

GENERAL EDUCATION: 21 credits
(12 of these 21 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 55 credits
(This includes 12 credits of General Education courses: 3 credits of GWS courses; 6 credits of GS courses; 3 credits of GN courses.)

PRESCRIBED COURSES (55 credits)
BIOL 129 GN(4)[1], BIOL 141 GN(3)[1], BIOL 142 (1)[1], ENGL 015 GWS(3), HD FS 129 GS(3), O T 100(1), O T 101(3)[1], O T 103(3)[1], O T 105W(3)[1], O T 107(3)[1], PSY 002 GS(3) (Sem: 1-2)
KINES 013 GHA(1), O T 202(3)[1], O T 204(3)[1], O T 206(3)[1], O T 295A(6)[1], O T 295B(6)[1], PSY 243 GS(3) (Sem: 3-4)

PHYSICAL THERAPIST ASSISTANT

Commonwealth College (Penn State DuBois; Hazleton, Mont Alto, Shenango)

This major helps prepare individuals to become skilled technical health workers who assist the physical therapist in patient treatment. Students develop knowledge and skills in the appropriate use of equipment and exercise associated with various physical therapy treatment modalities. In order to accomplish these tasks, the major utilizes a combination of basic science and nonscience course work coupled with health education courses specifically designed for the physical therapist assistant. The program culminates with a full semester of clinical experience.

To enter this major, students must have a high school diploma and satisfactory Scholastic Assessment Test (SAT I) scores.

The size of each entering class is limited so that optimal clinical experiences and practical application situations can be maintained. Students are admitted into the program only during the fall semester and must progress through the program in the prescribed manner. Clinical affiliations are maintained over a wide geographical area. Students may be required to make special housing and transportation arrangements during the clinical phase.

For the Associate in Science degree in Physical Therapist Assistant, a minimum of 68 credits is required.

GENERAL EDUCATION: 21 credits
(9-12 of these 21 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 59 credits
(This includes 9-12 credits of General Education courses: 3-6 credits of GWS courses; 3 credits of GN courses; 3-6 credits of GS courses.)

PRESCRIBED COURSES (41 credits)
BIOL 129 GN(4)[1], BIOL 141 GN(3)[1], BIOL 142(1)[1], ENGL 015 GWS(3), P T 100(3)[1], P T 384(4)[1] (Sem: 1-2)
P T 150(2)[1], P T 160(3)[1], P T 250(4)[1], P T 260(3)[1], PSY 002 GS(3) (Sem: 3-4)
P T 395F(4)*[1], P T 395G(4)*[1] (Sem: 5)

ADDITIONAL COURSES (18 credits)[1]
P T 270(3) or P T 270W(3) (Sem: 1-2)
KINES 013(1) or KINES 303 GHS(3)[1] (Sem: 1-4)
P T 280(4) or P T 280W(4) (Sem: 3-4)
CAS 203(3), ENGL 202C GWS(3), or PSY 213 GS(3) (Sem: 4-5)
P T 395E(4)* or P T 395W(4)* (Sem: 5)
Select 1-3 credits from any P T course not listed above in prescribed or additional courses. (Sem: 1-5)

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[1]A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
*Courses that include clinical education experiences may require the student to travel long distances or obtain housing near the assigned clinic. Housing and transportation arrangements are the responsibility of the student.

PLASTICS ENGINEERING TECHNOLOGY

Penn State Erie, The Behrend College

This major is designed to help graduates prepare for careers as engineering technicians in the plastics industry. Graduates are qualified for positions requiring setting up and operating plastics processing equipment, troubleshooting processing problems, production line management, technical service, and support.

The curriculum provides training in applied mathematics, physics, chemistry, fundamentals of the chemical and physical properties of plastics materials and their processing characteristics, quality control, and technical communications. The processing component of the curriculum emphasizes injection molding. Students will receive extensive "hands-on" experience in the college's state-of-the-art processing laboratory, learning the fundamental principles of operating equipment currently utilized in the plastics industry. They will also gain an understanding of how the various mechanical, hydraulic, and electrical functions of processing machinery work together to form a plastic product.

Graduates of this program may qualify for admission to the baccalaureate degree program in Plastics Engineering Technology offered at Penn State Erie, The Behrend College.

For the Associate in Engineering Technology degree in Plastics Engineering Technology, a minimum of 68 credits is required.

GENERAL EDUCATION: 21 credits
(12 of these 21 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 59 credits
(This includes 12 credits of General Education courses: 3 credits of GN courses; 3 credits of GQ courses; 6 credits of GWS courses.)

PRESCRIBED COURSES (49 credits)
ENGL 015 GWS(3), PL ET 050(3), METBD 110(3), METBD 111(3)(Sem: 1-2)
IE T 101(3)[1], MCH T 111(3), PHYS 150 GN(3) (Sem: 1-2)
CAS 100 GWS(3), CHEM 012 GN(3), CHEM 014 GN(1), MCH T 213(3), PL ET 205(3)[1], PL ET 206W(3)[1], PL ET 217(3)[1], PL ET 234(4)[1], PL ET 270(3)[1], Q C 200(2)[1] (Sem: 3-4)

ADDITIONAL COURSES (10 credits)
MATH 081 GQ(3)[1], MATH 082 GQ(3)[1], MATH 083 GQ(4)[1]; or MTHBD 091 GQ(5)[1], MTHBD 092 GQ(5) (Sem: 1-2)

RADIOLOGICAL SCIENCES

Capital College (Penn State Schuylkill); Commonwealth College (Penn State New Kensington)

For students interested in pursuing an education in the paramedical field of radiography (radiologic technology), the radiological sciences major meets the educational and clinical requirements for the graduate to function as an entry-level radiographer. Required course work is divided into three interrelated areas including general education, radiography-specific, and clinical education components. During the clinical education component, students perform radiographic exams under the directed supervision of certified radiographers at multiple area clinical education settings. The clinical component emphasizes the concepts of team practice and patient-centered care. Both the radiography-specific course work and the clinical component are structured sequentially over seven consecutive semesters, commencing each fall semester. Upon successful completion of the 72-credit associate degree, the graduate will be eligible to attempt the American Registry of Radiologic Technologists (ARRT) examination for certification.

For the Associate degree in Radiological Sciences, a minimum of 72 credits is required.

GENERAL EDUCATION: 21 credits
(15 of these 21 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 66 credits
(This includes 15 credits of General Education courses: 3 credits of GH courses; 3 credits of GN courses; 6 credits of GQ courses; 3 credits of GWS courses.)

PRESCRIBED COURSES (66 credits)
BIOL 129 GN(4)[1], BIOL 141 GN(3), ENGL 015 GWS(3), MATH 021 GQ(3), RADSC 101(4)[1], RADSC 102(4)[1], RADSC 110(3)[1], RADSC 295(2.5)[1] (Sem: 1-2)
RADSC 103(3)[1], RADSC 210W(3)[1], RADSC 295(1)[1] (Sem: 3)
CMPSC 101 GQ(3), PHIL 103 GH(3), RADSC 204(3)[1], RADSC 205(3)[1], RADSC 220(3)[1], RADSC 230(3)[1], RADSC 295(2.5)[1] (Sem: 4-5)

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[1]A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

RADSC 206(3)[1], RADSC 240(2)[1], RADSC 295(1)[1] (Sem: 6)
RADSC 207(4)[1], RADSC 295(2)[1] (Sem: 7)

SCIENCE

Altoona College; Capital College; Commonwealth College (Penn State Beaver, DuBois, Fayette, McKeesport, New Kensington, Shenango)

The Science major is designed primarily to provide for the basic educational needs of students who want to pursue professional programs in various scientific or medical fields. The program provides a fundamental group of science courses of value to those who seek positions in government or industry where such knowledge is necessary or desirable. The program offers sufficient flexibility to meet diverse academic and career goals.

Graduates of the program may qualify for admission to the baccalaureate degrees in Science. Students planning on continuing in baccalaureate degrees are encouraged to work closely with their advisers.

For the Associate in Science degree in Science, a minimum of 67 credits is required.

GENERAL EDUCATION: 21 credits
(15 of these 21 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 61 credits
(This includes 15 credits of General Education courses: 3 credits of GN courses; 3 credits of GQ courses; 3 credits of GWS courses; 3 credits of GH courses; 3 credits of GQ, GWS, GH, or GN courses.

PRESCRIBED COURSES (14 credits)
BIOL 110 GN(4)[1], CAS 100 GWS(3)[1], CHEM 012 GN(3)[1], CHEM 014 GN(1)[1] ENGL 015 GWS(3)[1] (Sem: 1-4)

ADDITIONAL COURSES (22-27 credits)
(Note: PHYS 250 and PHYS 251 and MATH 140 are recommended for students planning to continue in baccalaureate programs of science.)
Select 4-6 credits from MATH 022 GQ(3), MATH 026 GQ(3), or MATH 040 GQ(5), or MATH 140 GQ(4) (Sem: 1-2)
Select 3-4 credits from STAT 200 GQ(4), STAT 220(3), STAT 250 GQ(3) (Sem: 1-4)
Select 3 credits from PHIL 002 GH(3), PHIL 103 GH(3), PHIL 103W GH(3), PHIL 110 GH(3), PHIL 118 GH(3), PHIL 221 GH(3) (Sem: 1-4)
Select 3 credits form CMPSC 100(3), M I S 103(3), CMPSC 101 GQ(3) (Sem: 1-4)
Select 6-8 credits from PHYS 150 GN(3) and PHYS 151 GN(3) or PHYS 250 GN(4) and PHYS 251 GN(4) (Sem: 2-4)
Select 3 credits from CHEM 013 GN(3), CHEM 034(3) (Sem: 2-4)

SUPPORTING COURSES AND RELATED AREAS (20-25 credits)
Select 20-25 credits from approved departmental list of Biological/Math/Physical Sciences (Sem: 1-4)

SOCIOLOGY

College of the Liberal Arts; World Campus

This major introduces students to the study of human groups and their relationships to each other and to the environment. It enables students to gain some proficiency in the scientific study of group structures and processes. A further objective is to help students become more skillful in working with community institutions, agencies, and organizations either through gainful employment or as a volunteer. Graduates may qualify for admission to the baccalaureate degree majors in Behavioral Sciences, Humanities, or Public Policy offered at Penn State Harrisburg.

For the Associate in Arts degree in Sociology, a minimum of 60 credits is required.

GENERAL EDUCATION: 21 credits
(See description of General Education in front of Bulletin.)

ELECTIVES: 9 credits

REQUIREMENTS FOR THE MAJOR: 30 credits[1]

PRESCRIBED COURSES (6 credits)
SOC 001 GS(3) (Sem: 1-2)
SOC 007(3) (Sem: 3-4)

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[1]A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

ADDITIONAL COURSES (12 credits)
Select 12 credits from SOC 003 GS(3), SOC 005 GS(3), SOC 012 GS(3), SOC 013 GS(3), SOC 015 GS(3), SOC 023 GS(3), SOC 030 GS(3), SOC 047(3), or SOC 055 GS(3) (Sem: 1-4)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 12 credits in arts, humanities, social and behavioral sciences (Sem: 1-4)

SURVEYING TECHNOLOGY

School of Engineering Design, Technology, and Professional Programs, College of Engineering; Program Coordinator, Penn State Wilkes-Barre

This major provides the basic undergraduate education required for private and public service as a survey technician in the surveying profession. Basic knowledge is provided in the areas of land, construction, geodetic, photogrammetry, and topographic surveys. The curriculum is designed to develop an individual appreciation of the skills and equipment needed to make precise measurements in the field of surveying.

Graduates of the Surveying Technology major may qualify for admission to the baccalaureate degree major in Surveying at Penn State Wilkes-Barre or the Structural Design and Construction Engineering Technology offered at Penn State Harrisburg.

For the Associate in Engineering Technology degree in Surveying Technology, a minimum of 67 credits is required. This program is accredited by the Technology Accreditation Commission of ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202-4012, telephone: 410-347-7700, or **www.abet.org**.

GENERAL EDUCATION: 21 credits
(12 of these 21 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 58 credits
(This includes 12 credits of General Education courses: 3 credits of GN courses; 3 credits of GQ courses; 6 credits of GWS courses.)

PRESCRIBED COURSES (56 credits)
EG T 101(1), EG T 102(1), ENGL 015 GWS(3), ET 002(1), MATH 081 GQ(3), MATH 082 GQ(3), PHYS 150 GN(3), SUR 111(3)[1], SUR 112(3), SUR 162(3)[1] (Sem: 1-2)
CAS 100A GWS(3), ENGL 202C GWS(3), MATH 083 GQ(4), PHYS 151(3), SUR 211(2), SUR 222(3), SUR 241(3), SUR 262(2), SUR 272(3), SUR 313(3), SUR 372W(3) (Sem: 3-4)

ADDITIONAL COURSES (2-3 credits)
Select a minimum of 2-3 credits from the following technical courses: CE T 261(3), MCH T 111(3), SUR 362(3), SUR 375(2) (Sem: 3-4)

TELECOMMUNICATIONS TECHNOLOGY

School of Engineering Design, Technology, and Professional Programs, College of Engineering; Program Coordinator, Penn State Wilkes-Barre

The field of telecommunications includes the transmission of voice and digital signals by telephone, telegraph, radio, television, fiber optics, and satellite. Graduates of the Telecommunications Technology major can become engineering technicians who help select, design, install, operate, maintain, troubleshoot, and repair modern telecommunications systems. Future uses for telecommunications systems include electronic mail, electronic shopping, home computer terminal tie-ins, remote utility meter reading, and the transmission of biomedical data among hospitals, libraries, and doctors' offices.

Graduates of the Telecommunications Technology major may qualify for admission to the baccalaureate degree major in Electrical Engineering Technology offered at Penn State Harrisburg or Penn State Erie, The Behrend College.

For the Associate in Engineering Technology degree in Telecommunications Technology, a minimum of 69 credits is required. This program is accredited by the Technology Accreditation Commission of ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202-4012, telephone: 410-347-7700, or **www.abet.org**.

GENERAL EDUCATION: 21 credits
(12 of these 21 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 60-62 credits
(This includes 12 credits of General Education courses: 3 credits of GN courses; 3 credits of GQ courses; 6 credits of GWS courses.)

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[1]A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

PRESCRIBED COURSES (59 credits)
EE T 101(3), EE T 109(1), EE T 114(4), EE T 117(3), EE T 118(1), EE T 120(1), EG T 101(1), EG T 102(1), ENGL 015 GWS(3), ET 002(1), ET 005(1), MATH 081 GQ(3), MATH 082 GQ(3), PHYS 150 GN(3), TELCM 140(2) (Sem: 1-2)
CAS 100 GWS(3), EE T 205(1), EE T 210(2), EE T 211(3)[1], EE T 216(3), EE T 221(1), MATH 083 GQ(4), PHYS 151(3), TELCM 241(3), TELCM 242(1)[1], TELCM 243(3)[1], TELCM 244(1) (Sem: 3-4)

ADDITIONAL COURSES (1-3 credits)
Select 1-3 courses from the following technical courses: BE T 297(1-9), EE T 213W(5), EE T 297(1-9), EG T 201(2), IE T 105(2), MCH T 111(3), ME T 297(1-9), SUR 111(3) (Sem: 3-4)

WILDLIFE TECHNOLOGY

College of Agricultural Sciences; offered through Commonwealth College (Penn State DuBois)
The Wildlife Technology major helps prepare students in the techniques of wildlife management. Personnel trained in this field are needed to assist in the applied phases of natural resource management, wildlife biology, range management, and the care, maintenance, and propagation of animals. Graduates should be able to support professionals in wildlife biology, park managers, game refuge managers, and laboratory technicians in research.

For the Associate in Science degree in Wildlife Technology, a minimum of 66 credits is required.

GENERAL EDUCATION: 21 credits
(See description of General Education in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 45 credits

PRESCRIBED COURSES (45 credits)
FORT 150(3), FORT 160(3), SUR 162(3), WILDL 101(3)[1], WILDL 103(3)[1], WILDL 106(4) (Sem: 1-2)
AG 113(1), FOR 242(3), KINES 013 GHS(1), WILDL 204(4), WILDL 207(3), WILDL 208(3)[1], WILDL 209(4), WILDL 211(4), WILDL 213(3) (Sem: 3-4)

[1]A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

BACCALAUREATE DEGREE PROGRAMS

FOOTNOTES ARE AT THE END OF EACH DESCRIPTION.
SCHEDULING RECOMMENDATION BY SEMESTER STANDING FOR EACH MAJOR IS GIVEN LIKE THIS: (Sem: 1-2)

ACCOUNTING

Smeal College of Business

This major helps prepare students for careers in public, industrial, or governmental accounting and also provides an appropriate background for those planning to enter law school or graduate school. Public accounting is carried on by independent practitioners, most of whom are certified public accountants. In addition to independent audits, CPAs render accounting, tax, and management advisory services. The credit requirements to sit for the CPA examination in Pennsylvania and many other states are automatically met by completing the prescribed curriculum. However, there are exceptions, including New Jersey, New York, Ohio, and Texas. For more detailed information, see brochures in the department office.

The industrial accountant, as an executive in a business firm, is in charge of designing and supervising the financial and managerial accounting system, including the preparation and analysis of reports. Many are now taking the Certified Management Accountant (CMA) exam. It is a two-day exam covering economics, finance, management, decision analysis, information systems, and accounting. Governmental accountants occupy positions in federal, state, and local government and perform services similar to those of public or industrial accountants.

For the B.S. degree in Accounting, a minimum of 120 credits is required.

GENERAL EDUCATION: 45 credits
(15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR:
(Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE:
(Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 9-11 credits

REQUIREMENTS FOR THE MAJOR: 79-81 credits
(This includes 15 credits of General Education courses: 3 credits of GWS courses; 6 credits of GQ courses; and 6 credits of GA, GH, or GS courses.)

PRESCRIBED COURSES (49 credits)
ACCTG 211(4)[1], CMPSC 203 GQ(4), ECON 002 GS(3), ECON 004 GS(3) (Sem: 1-4)
ACCTG 311(3)[1], B A 301(2), B A 302(2), B A 303(2), B A 304(2), ENGL 202D GWS(3)[1] (Sem: 5-6)
ACCTG 306(4), ACCTG 403W(4), ACCTG 404(4), ACCTG 471(3)[1], ACCTG 472(3)[1], B A 411(3) (Sem: 5-8)

ADDITIONAL COURSES (14-16 credits)
MATH 110 GQ(4) or MATH 140 GQ(4) (Sem: 1-2)
MS&IS 200(4) or STAT 200(4) (Sem: 1-2)
M I S 204(2) or IST 110(4) (Sem: 3-4)
B A 243(4) or B A 241(2) and B A 242(2) (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (16 credits)
Select 4 credits: Attainment of 12th credit level proficiency in a single foreign language. Proficiency must be demonstrated by either examination or course work (Sem: 1-4)
Select 6 credits of Global Awareness and Understanding from approved course list (credits must be taken in GA, GH, or GS) (Sem: 1-8)
Select 6 credits of supporting course work. See department list. (Sem: 5-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

ACCOUNTING

Capital College

This major helps students prepare for careers in auditing and public accounting, industrial and managerial accounting, and in governmental and non-public accounting. It also provides a sound background for students

who plan to pursue graduate studies in accounting or related fields. Students who complete the prescribed courses and earn a bachelor of science degree will satisfy the academic requirements. Graduates may also elect to pursue other professional certifications, including certified Managerial Accountant (CMA), the Certified Internal Auditor (CIA), Certified Fraud Examiner (CFA), and Certified Government Financial Manager (DGFM). Because the Harrisburg area is the center of industry and economic development for south-central Pennsylvania, students are provided with many opportunities to experience the world of business.

For a B.S. in Accounting a minimum of 122 credits is required. At least 50 percent of the business credit hours required for the degree must be taken at the Capital College. No more than 61 credits should be from business and business-related courses.

ENTRY TO MAJOR REQUIREMENTS: Entry to the Accounting major requires the completion of 9 entry-to-major courses: ENGL 015 GWS(3) or ENGL 030 GWS(3), MATH 110 GQ(4) or MATH 140 GQ(4), ACCTG 211(4), CMPSC 203 GQ(4) or M I S 103(3), M I S 204(2), STAT 200 GQ(4) or MS&IS 200(4), ECON 002 GS(3), ECON 004 GS(3), B A 243(4) and a 2.00 or higher cumulative grade-point average. Additional information about this major is available in the office of the Director of Undergraduate Studies, School of Business Administration at Penn State Harrisburg.

GENERAL EDUCATION: 45 credits
(10-12 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education Course Requirements in front of Bulletin.)

FIRST-YEAR SEMINAR:
(Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE:
(Included in REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: Select 6-7 credits of non-business courses.

REQUIREMENTS FOR THE MAJOR: 81-82 credits
(This includes 10-12 credits of General Education Courses: 3 credits of GWS courses; 3 credits of GS courses; 4-6 credits of GQ courses)

PRESCRIBED COURSES (58 credits)
ACCTG 211(4)[1] (Sem: 1-4)
B A 243(4) (Sem: 1-4)
ECON 002 GS(3), ECON 004 GS(3) (Sem: 1-4)
ENGL 202D GWS(3) (Sem: 1-4)
M I S 204(2) (Sem: 1-4)
FINAN 320(3), BUS 361(3), BUS 364W GI(3), BUS 462(3), INFSY 390(3) (Sem: 5-8)
MNGMT 310(3), MRKT 370(3) (Sem: 5-8)
ACCT 301(3)[1], ACCT 310(3), ACCT 340(3)[1], ACCT 400(3)[1], ACCT 401(3)[1], ACCT 430(3) (Sem: 5-8)

ADDITIONAL COURSES (11-12 credits)
Select 3-4 credits from M I S 103(3) or CMPSC 203 GQ(4) (Sem: 1-4)
Select 4 credits from MATH 110 GQ(4) or MATH 140 GQ(4) (Sem: 1-4)
Select 4 credits from MS&IS 200(4) or STAT 200 GQ(4) (Sem: 1-4)
Select 6 credits from the following: ACCT 410(3), ACCT 420(3), ACCT 431(3), ACCT 435(3), ACCT 440(3), ACCT 450(3), ACCT 460(3), ACCT 470(3), ACCT 489(3), ACCT 494(1-12), ACCT 495(1-18), ACCT 496 (1-18), ACCT 497(1-9) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits from 200-400 level business courses from: ACCT, BUS, ECNMS, FINAN, INFSY, MNGMT, or MRKT in consultation with an academic adviser and in support of the student's interests. (Sem: 3-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

ACCOUNTING

Penn State Erie, The Behrend College

The Accounting major provides an opportunity to pursue a unique program that integrates knowledge and skill in accounting and information management. It helps prepare students for positions in public accounting firms, corporations, and government, where accounting skills are essential. In addition, the accounting major provides the necessary academic training for students interested in administrative responsibilities in the area of accounting. The major meets the requirements for taking the CPA and CMA professional examinations.

For the B.S. degree in Accounting, a minimum of 120 credits is required. Each student must earn at least a grade of C in each 300- and 400-level course in the major field.

GENERAL EDUCATION: 45 credits
(15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR:
(Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE:
(Included in REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 1 credit

REQUIREMENTS FOR THE MAJOR: 89 credits
(This includes 15 credits of General Education courses: 6 credits of GQ courses; 6 credits of GS courses; 3 credits of GWS courses.)

PRESCRIBED COURSES (64 credits)
CMPSC 203 GQ(4) (Sem: 1-2)
ACCTG 211(4), B A 243(4), ECON 002 GS(3), ECON 004 GS(3), ENGL 202D GWS(3), M I S 204(2), MS&IS 200(4) (Sem: 3-4)
ACNTG 310(4), ACNTG 311(3), ACNTG 320(3), FNC 300(3), MANGT 300(3), MANGT 310(3), MRKTG 300(3) (Sem: 5-6)
ACNTG 410(3), ACNTG 412(3), ACNTG 422(3), ACNTG 423(3), MANGT 470W(3) (Sem: 7-8)

ADDITIONAL COURSES (13 credits)
MATH 110 GQ(4) or MATH 140 GQ(4) (Sem: 1-2)
Select 3 credits from ECNS 470(3), MANGT 480 GI(3), MRKTG 470 GI(3), or other 400-level international business course (Sem: 5-8)
Select 6 credits from ACNTG 340(3), ACNTG 413(3), ACNTG 420(3), ACNTG 421(3), ACNTG 495(1-18), or other 300- to 400-level courses either within the major or from other business areas (see School list of approved courses) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 9-12 credits from one of the following nonbusiness supporting course areas: international studies, education abroad, foreign language, quantitative methods, or writing and speaking skills (see School list of approved courses) (See the Admission section of the general information in the front of this bulletin for the placement policy for Penn State foreign language courses.) (Sem: 1-8)
Select 0-3 credits from a second supporting course group (See school list of approved courses.) (Sem: 1-8)

ACTUARIAL SCIENCE

Smeal College of Business

An actuary is a business professional who uses mathematical skills to define, analyze, and solve business and social problems. Actuaries generally are employed in life, health, and casualty insurance companies, consulting firms, and government.

The courses in the Actuarial Science major stress the application of mathematical and statistical concepts to the measurement of life and other contingencies, while at the same time giving the student a broad understanding of the business environment.

Actuarial Science majors are encouraged to begin the series of professional examinations leading to Associateship and Fellowship in either the Society of Actuaries (ASA/FSA) or the Casualty Actuarial Society (ACAS/FCAS). Graduating students will have studied four of the five subjects that must be passed to qualify as an A.S.A. and four of the seven subjects needed to qualify as an ACAS. They commonly have passed at least the first two parts of these professional examinations by the time they graduate.

For the B.S. degree in Actuarial Science, a minimum of 130 credits is required.

GENERAL EDUCATION: 45 credits
(15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 6-8 credits

REQUIREMENTS FOR THE MAJOR: 92-94 credits
(This includes 15 credits of General Education courses: 3 credits of GWS courses; 6 credits of GQ courses; and 6 credits of GA, GH, or GS courses.)

PRESCRIBED COURSES (69 credits)
MATH 140 GQ(4), MATH 141 GQ(4) (Sem: 1-2)
ACCTG 211(4), CMPSC 203 GQ(4), ECON 002 GS(3), ECON 004 GS(3) (Sem: 1-4)
B A 301(2), B A 302(2), B A 303(2), B A 304(2), B A 411(3) (Sem: 5-6)
ENGL 202D GWS(3), MATH 220 GQ(2), MATH 230(4), STAT 414(3), STAT 415(3) (Sem: 5-6)
INS 301(3), INS 310W(3)[1], INS 320(3), INS 401(3)[1], INS 410(3)[1], INS 411(3)[1], INS 412(3)[1] (Sem: 5-8)

ADDITIONAL COURSES (10-12 credits)
MS&IS 200(4) or STAT 200(4) (Sem: 1-2)
M I S 204(2) or IST 110(4) (Sem: 3-4)
B A 243(4) or B A 241(2) and B A 242(2) (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (13 credits)
Select 4 credits: Attainment of 12th credit level proficiency in a single foreign language. Proficiency must be demonstrated by either examination or course work (Sem: 1-4)
Select 6 credits of Global Awareness and Understanding from approved course list (credits must be taken in GA, GH, or GS) (Sem: 1-8)
Select 3 credits of supporting course work. See department list. (Sem: 5-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

ADMINISTRATION OF JUSTICE, B.A.

Abington College; Commonwealth College
The degree in Administration of Justice provides students with a broadly based liberal education focused on the understanding and analysis of justice systems. Having grappled with the many dilemmas and controversies presented by the problems of administering justice in a complex society, graduates of this program are given the background to be educated, thoughtful, and intelligent citizens.

For the B.A. degree in Administration of Justice, a minimum of 123 credits is required.

GENERAL EDUCATION: 45 credits
(4-7 credits of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR:
(Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE:
(Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 14-18 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 43-44 credits[1]
(This includes 4-7 credits of General Education courses; 0-3 credits of GH courses; 4 credits of GQ courses.)

PRESCRIBED COURSES (13 credits)
ADM J 012 GS(3), ADM J 111(3), ADM J 221(3), STAT 200 GQ(4) (Sem: 3-4)

ADDITIONAL COURSES (24-25 credits)
Select 3-4 credits in values and ethics from B A 243(4), PHIL 003 GH(3), PHIL 103 GH(3), PHIL 105 GH(3), PHIL 106 GH(3), or PHIL/S T S 107 GH(3), S T S 100 GH(3), S T S 101 GH(3) or S T S/PHIL 107 GH(3) (Sem: 5-6)
Select 3 credits from ADM J 451 GI(3) or ADM J 453 GI(3) (Sem: 5-8)

Select 18 credits in ADM J, with at least 12 credits in the 400 level from: ADM J 013 GS(3), ADM J 083S GS(3), ADM J 200(3), ADM J 201(3), ADM J 230(3), ADM J 245(3), ADM J 270(3), ADM J 285(3), ADM J 300H(3), ADM J 301H(3), ADM J 302H(4), ADM J 340(3), ADM J 401(3), ADM J 406(3), ADM J 410(3), ADM J 412(3), ADM J 414(3), ADM J 420(3), ADM J 421(3), ADM J 421W(3), ADM J 422(3), ADM J 423(3), ADM J 424(3), ADM J 424W(3), ADM J 425(3), ADM J 426(3), ADM J 439(3), ADM J 441(3), ADM J 441W(3), ADM J 460(3), ADM J 462(3), ADM J 467(3), ADM J 471(3), ADM J 472(3), ADM J 473(3), ADM J 482(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits, in consultation with adviser, from University-wide offerings according to student's career plan (Sem: 5-8)
[1]A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

ADMINISTRATION OF JUSTICE. B.S.

Abington College; Commonwealth College
The Bachelor of Science degree is intended to prepare students for careers in the administration of justice. Two emphases are provided: (1) for students interested in entry-level employment in justice agencies; (2) for students interested in academic or research positions and who may seek graduate education before beginning employment.

For the B.S. degree in Administration of Justice, a minimum of 123 credits is required.

GENERAL EDUCATION: 45 credits
(4-7 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR:
(Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE:
(Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 17-21 credits

REQUIREMENTS FOR THE MAJOR: 64-65 credits[1]
(This includes 4-7 credits of General Education courses; 0-3 credits of GH courses; 4 credits of GQ courses.)

PRESCRIBED COURSES (13 credits)
ADM J 012 GS(3), ADM J 111(3), ADM J 221(3), STAT 200 GQ(4) (Sem: 3-4)

ADDITIONAL COURSES (39-40 credits)
(Some of the courses in this category may have prerequisites that are not included in the major.)
Select 3-4 credits in values and ethics from B A 243(4), PHIL 003 GH(3), PHIL 103 GH(3), PHIL 105 GH(3), PHIL 106 GH(3), or PHIL/S T S 107 GH(3), S T S 100 GH(3), S T S 101 GH(3) or S T S/PHIL 107 GH(3) (Sem: 5-6)
Select 3 credits from ADM J 451 GI(3) or ADM J 453 GI(3) (Sem: 5-8)
Select 18 credits in ADM J, with at least 9 credits in the 400 level from: ADM J 013 GS(3), ADM J 083S GS(3), ADM J 200(3), ADM J 201(3), ADM J 230(3), ADM J 245(3), ADM J 270(3), ADM J 285(3), ADM J 300H(3), ADM J 301H(3), ADM J 302H(4), ADM J 340(3), ADM J 401(3), ADM J 406(3), ADM J 410(3), ADM J 412(3), ADM J 414(3), ADM J 420(3), ADM J 421(3), ADM J 422(3), ADM J 423 GI(3), ADM J 424(3), ADM J 425(3), ADM J 426(3), ADM J 439(3), ADM J 441(3), ADM J 460(3), ADM J 462(3), ADM J 467(3), ADM J 471(3), ADM J 472(3), ADM J 473(3), ADM J 482(3) (Sem: 5-8)
Select 15 credits—emphasis a or b:
a. Field Research emphasis: ADM J 240W(4), ADM J 394(1), ADM J 494(5), ADM J 495(5) (Sem: 5-8)
b Research and Policy Analysis emphasis: Select 15 credits, at least 6 at the 400 level from: ADM J 424W(3), AM ST 402W(3-6), any CMPSC (3), ECON 004 GS(3), L I R 101 GS(3), L ST 470(3), PL SC 002(3), PL SC 419(3), PL SC 420(3), SOC 409 GS;GI(3), SOC 419(3), SOC 422(3), or SOC 423(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 12 credits, in consultation with adviser, from University-wide offerings according to student's career plan (Sem: 5-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44..

ADVERTISING-PUBLIC RELATIONS

College of Communications

This major is designed to provide a balance of theory, research, and practice. The course sequence provides professional skills courses in conjunction with applied theory and critical evaluative courses. Students develop an understanding of the role and effect of advertising and public relations within the business, social, and political arenas. Students develop abilities and skills that prepare them for a wide range of professional opportunities that include: media planning and relations, research, client services. Analytical abilities are equally stressed throughout the curriculum. Critical thinking skills, creative problem-solving, and the need to justify decisions are developed. Theory and practice from a wide range of disciplines including business, behavioral sciences, and applied statistics are used to equip the students to make informed decisions in a dynamic environment.

ADVERTISING OPTION: All courses in the advertising major emphasize the critical importance of integrated communication. The objective of the curriculum is to prepare students for entry-level opportunities in the advertising profession and to prepare for eventual managerial roles where an understanding of integrated communication concepts is essential.

The program reflects an integrated marketing communications approach to the design implementation and evaluation of advertising messages. In addition to mastering the core professional courses, students are expected to have an understanding of the convergence of mass communication theory and practice and are encouraged to select from courses in communication theory, communication law, mass media history, ethics, and the impact of advertising and public relations on society.

PUBLIC RELATIONS OPTION: The public relations curriculum prepares students for the challenges of public relations practice in a highly competitive, technological, multicultural, and global environment. In their course of study, students study the role and function of public relations in building cooperative mutually beneficial relations between organizations and their constituent publics through understanding, credibility, and trust.

Students complete a core set of courses that includes news writing, introduction to public relations, public relations methods, mass communication research, and public relations problems (campaigns).

Because of the critical importance of journalistic writing skills and an understanding of news media ethics, public relations majors are encouraged to take additional journalism courses to fulfill their communication electives.

Advertising and public relations students are encouraged to choose a minor from outside the College of Communications. The majority of majors select minors in business, English, sociology, psychology, political science, information systems and statistical analysis, foreign language, and speech communication.

Students must select at least 80 credits in courses outside the College of Communications, including at least 65 in the liberal arts and sciences.

For the B.A. degree in Advertising-Public Relations, a minimum of 120 credits is required.

GENERAL EDUCATION: 45 credits
(10 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR:
(Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE:
(Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 27 credits

COLLEGE OF COMMUNICATIONS BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 34 credits[1]
(This includes 10 credits of General Education courses: 6 credits of GS courses; 4 credits of GQ courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 16 credits

PRESCRIBED COURSES (13 credits)
COMM 420(3), ECON 002 GS(3), PSY 002 GS(3), STAT 200 GQ(4) (Sem: 1-4)

SUPPORTING COURSES AND RELATED AREAS (3 credits)
Select 3 credits of COMM courses (other than COMM 100 GS or COMM 120) (Sem: 5-8)

REQUIREMENTS FOR THE OPTION: 18 credits

ADVERTISING OPTION: 18 credits

PRESCRIBED COURSES (12 credits)
COMM 320(3) (Sem: 3-6)
COMM 421W(3), COMM 422(3) (Sem: 5-6)
COMM 424(3) (Sem: 7-8)

ADDITIONAL COURSES (6 credits)
Select 6 credits from COMM 370(3), COMM 410(3), COMM 411(3), COMM 417(3), COMM 418(3), COMM 425(3), COMM 468(3), COMM 496, COMM 499 (Sem: 5-8)

PUBLIC RELATIONS OPTION: 18 credits

PRESCRIBED COURSES (12 credits)
COMM 260W(3) (Sem: 3-4)
COMM 370(3) (Sem: 5-6)
COMM 471(3) (Sem: 5-8)
COMM 473(3) (Sem: 7-8)

ADDITIONAL COURSES (6 credits)
Select 6 credits from COMM 320(3), COMM 401(3), COMM 403(3), COMM 409(3), COMM 418(3), COMM 462(3), COMM 464(3), COMM 468(3) or COMM 496(3), COMM 499 (Sem: 5-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44..

AEROSPACE ENGINEERING

College of Engineering

This major emphasizes the analysis, design, and operation of aircraft and spacecraft. Students learn the theories and practices in the fundamental subjects of aeronautics, astronautics, aerodynamics and fluid dynamics, aerospace materials and structures, dynamics and automatic control, aircraft stability and control and/or orbital and attitude dynamics and control, air-breathing and rocket propulsion, aircraft systems design and /or spacecraft systems design. All of these place significant weight on the development and use of teamwork and communications skills for effective problem-solving. Graduates in aerospace engineering find employment in the customary settings such as government laboratories, large and small aerospace firms, and in nontraditional positions that also require the use of systems-engineering approaches to problem-solving; they can also pursue graduate study in aerospace engineering and related fields.

Graduates with a Bachelor of Science in Aerospace Engineering are able to: (1) analyze the dynamics and control characteristics of aerospace vehicles, including the basic translational and rotational dynamics, and the basic theory and practice used to control these motions; (2) analyze fluid dynamics, including the regimes of subsonic, transonic, and supersonic flows, inviscid and viscous flows, and laminar and turbulent flows; (3)apply knowledge of the fundamentals of aeronautics, including aerodynamic characteristics of aircraft, propulsion systems, airplane performance, and elementary aircraft stability and control; (4) apply knowledge of the fundamentals of astronautics, including orbital mechanics, attitude dynamics and control, rocket propulsion, and the space environment; (5) predict performance, and conduct preliminary design, of gas turbine and rocket-based propulsion systems and their components; (6) analyze the detailed dynamics, stability, and control of either aircraft or spacecraft; (7) analyze and design structural elements such as bars, beams, plates, and thin-walled structures; (8) make measurements to test hypotheses or to characterize the performance of physical systems (aerodynamic, structural, and control), and analyze and interpret the data in written reports; (9) complete the successive stages of conceptual, preliminary, and detailed design of an aircraft or spacecraft mission and the associated vehicles; (10) function effectively on teams to solve problems in complex aerospace systems that require knowledge of multiple disciplines; (11) apply an understanding of professional and ethical responsibility to realistic situations; (12) make effective oral and written presentations in a format appropriate for the setting; (13) explain how this profession affects society as a whole, and demonstrate an appreciation of how technical issues guide societal actions; (14) demonstrate an awareness of the need to stay abreast of technical developments throughout their working careers, and demonstrate that they are able to maintain and extend their learning, and (15) make appropriate and effective us of computer software, hardware, and state-of-the-art laboratory instrumentation.

The first two years of study are similar to those in other engineering majors and provide students with a basic education for the engineering profession. Students need to complete E MCH 012, CMPSC 201, MATH 220, MATH 230, and MATH 251 prior to the start of the junior year in order to meet graduation requirements in the following two years. Six of the nine technical-elective credits taken in the senior year must be aerospace engineering courses; however, this may be waived for students with special program requirements (including ROTC, Engineering Cooperative Education, minors, double-majors, and concurrent-degree programs).

For the B.S. degree in Aerospace Engineering, a minimum of 137 credits is required. This baccalaureate program in Aerospace Engineering is accredited by the Engineering Accreditation Commission of ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202-4012; telephone 410-347-7700; or **www.abet.org**.

GENERAL EDUCATION: 45 credits
(21 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR:
(Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE:
(Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 114 credits
(This includes 21 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses; 3 credits of GWS courses.)

PRESCRIBED COURSES (90 credits)
CHEM 012 GN(3), ED&G 100(3), MATH 140 GQ(4), MATH 141 GQ(4), PHYS 211 GN(4) (Sem: 1-2)
E MCH 011(3), E MCH 012(3)[1], E MCH 013(3)[1], M E 030(3), MATH 220 GQ(2), MATH 230(4), MATH 251(4), PHYS 212 GN(4), PHYS 213 GN(2), PHYS 214 GN(2) (Sem: 3-4)
AERSP 301(3), AERSP 302(3), AERSP 304(3), AERSP 306(3)[1], AERSP 309(3)[1], AERSP 311(4), AERSP 312(4), AERSP 313(3)[1], E E 305(3), E MCH 215(2), E MCH 216(1) (Sem: 5-6)
AERSP 405W(2), AERSP 406W(2), AERSP 410(3), ENGL 202C GWS(3) (Sem: 7-8)

ADDITIONAL COURSES (14 credits)
Select 1 credit of First-Year Seminar (Sem: 1-2)
ECON 002 GS(3), ECON 004 GS(3), or ECON 014 GS(3) (Sem: 1-2)
CMPSC 201C GQ(3) or CMPSC 201F GQ(3) (Sem: 7-8)
AERSP 401A(2), AERSP 401B(2); or AERSP 402A(2), AERSP 402B(2) (Sem: 7-8)
AERSP 413(3) or AERSP 450(3) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (9 credits)[27]
Select 9 credits of technical courses from department list (Students may apply 6 credits of ROTC.) (Sem: 7-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

AFRICAN AND AFRICAN AMERICAN STUDIES

College of the Liberal Arts
This interdisciplinary major is designed to give students an integrated and critical understanding of the experiences and contributions of peoples of African descent. Students are encouraged to do research and evaluate the relationship between the political, social, and economic developments in Africa and the African Diaspora. Two options are available within the major and are described here.

AFRICAN AMERICAN STUDIES OPTION: This option provides students with the opportunity to explore the experiences of African Americans using theories and methods originating in the field along with those adopted from the various disciplines. Students are also made aware of the potential to apply knowledge to discern better approaches for solving social, political, and economic problems. The curriculum also promotes greater understanding of the relationship between African American and other ethnic groups in the shaping of American society and culture.

Focus Areas: The African American Studies option has three focus areas, which are described below.
A. History Perspective: While stressing the interdisciplinary nature of the field, this focus allows students to concentrate on the historical experience of the African Americans, including their political, social, and economic relations with other ethnic groups, as well as the shifting historical contexts in which they have contested and shaped the evolution of American society.
B. Social Sciences and Community Development: This focus area allows students to concentrate on contemporary political and economic experiences of African Americans as well as on public policy issues that pertain to the economic, political, and social engagement of African Americans in the search for equality in American society.
C. Cultural and Gender Perspective: This focus area allows students to concentrate on culture and gender in historical and contemporary terms.

AFRICAN STUDIES OPTION: This option provides students with the opportunity to examine the geographical, cultural, historical, political, and economic aspects of Africa. This option has two focus areas as described below.
A. Humanities Perspective: This focus area enables students to concentrate on the history and culture of African societies and the evolution of Africa in world history.
B. Social Science Perspective: This focus area enables students to concentrate on political and economic developments, including state building and ethnic relations, development strategies, and Africa's position in the global system.

For the B.A. degree in African and African American Studies, a minimum of 123 credits is required.

GENERAL EDUCATION: 45 credits
(0-10 credits of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin)

FIRST-YEAR SEMINAR:
(Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in ELECTIVES or GENERAL EDUCATION course selection)

ELECTIVES: 9-18 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 36-45 credits[1]
(This includes 0-9 credits of General Education courses in the African American Studies Option; 0-3 credits of GA courses; 0-3 credits of GH courses; 0-3 credits of GS courses and 0-3 credits of General Education courses in the African Studies Option; 0-3 credits of GH courses or 0-3 credits of GS courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 12 credits

PRESCRIBED COURSES (12 credits)
AAA S 100 GS;GI(3), AAA S 110 GS;GI(3), AAA S/HIST 232 GH(3), SOC 007(3) (Sem: 1-4)

REQUIREMENTS FOR THE OPTION: 24-33 credits

AFRICAN AMERICAN STUDIES OPTION: 24-33 credits

PRESCRIBED COURSES (9 credits)
AAA S/WMNST 101 GH;GI(3), AAA S/SOC/WMNST 103 GI(3) (Sem: 1-4)
AAA S 401(3) (Sem: 5-8)

ADDITIONAL COURSES (24 credits)
Select 24 credits from one of the following three areas of concentration.
A minimum of 12 credits should be AAA S courses, and at least 12 of these credits must be at the 400 level or above.
A. History Perspective:
AAA S/RL ST 146 GH;GI(3), AAA S/RL ST 147 GH;GI(3), AAA S/HIST 152 GH;GI(3), AAA S/HIST 210 GH;GI(3), SOC 119 GS;GI(4) (Sem: 1-4)
AAA S/SOC 409 GS;GI(3), AAA S 431 GI(3), AAA S/HIST 465 GI(3), ENGL 461 GI(3), ENGL 469 GI(3), PL SC 474(3) (Sem: 5-8)
B. Social Sciences and Community Development:
AAA S/WMNST 102 GH;GI(3), AAA S/RL ST 146 GH;GI(3), AAA S/RL ST 147 GH;GI(3), AAA S/HIST 210 GH;GI(3), SOC 119 GS;GI(4) (Sem: 1-4)
ADM J 451 GI(3), AAA S/SOC 409 GS;GI(3), AAA S 431 GI(3), AAA S/HIST 465 GI(3), ECON 304 GS(3), ECON 436 GI(3), EDTHP 411 DF(3), PL SC 420(3) (Sem: 5-8)
C. Cultural and Gender Perspective:
AAA S/WMNST 102 GH;GI(3), AAA S/RL ST 145 GH;GI(3), AAA S 200 DF(3), AAA S/THEA 208 GA;GI(3), AAA S/PSY 245(3), AAA S/PSY 251 GI(3), COMM/WMNST 205 DF(3), ENGL 139 GH;GI(3), ENGL 235 GI(3), MUSIC 007 GA;GI(3), SOC 119 GS;GI(4) (Sem: 1-4)
AAA S/WMNST 410(3), AAA S/THEA 412 GI(3), AAA S/CAS 422 GI(3), COMM 411(3), EDTHP 411 DF(3), ENGL/WMNST 462 GI(3), ENGL 463 GI(3), ENGL 467 GI(3), ENGL 469 GI(3) (Sem: 5-8)

AFRICAN STUDIES OPTION: 30-33 credits

PRESCRIBED COURSES (12 credits)
AAA S/HIST 191 GH;GI(3), AAA S/HIST 192 GH;GI(3) (Sem: I-4)
AAA S 400(3), AAA S/PL SC 454 GI(3) (Sem: 5-8)

ADDITIONAL COURSES (21 credits)
Select 21 credits from one of the following two areas of concentration.
A minimum of 12 credits should be AAA S courses, and at least 12 of these credits must be at the 400 level or above.
A. Humanities Perspective:
AAA S 202 GS;DF(3), CMLIT 003 GH;GI(3), SWA 001(4), SWA 002(4) (Sem: I-4)
AAA S 404 DF(3), AAA S 431GI(3), AAA S/HIST 465 GI(3), ANTH 447 DF(3), CMLIT 422(3), CMLIT 423(3), EDTHP 404(3), FR 458 GI(3), HIST 479(3), R SOC/WMNST 420 GI(3) (Sem: 5-8)
B. Social Science Perspective:
AAA S 202 GS;DF(3), SWA 001(4), SWA 002(4) (Sem: 1-4)
AAA S 403 DF(3), AAA S 404 DF(3), AAA S 43IGI(3), AAA S/HIST 465 GI(3), ECON 304 GS(3), ECON 471(3), GEOG 444(3), PL SC 453(3-6) (Sem: 5-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

AGRICULTURAL AND BIOLOGICAL ENGINEERING

College of Agricultural Sciences; College of Engineering
This major helps prepare students for careers involving the application of engineering principles to agricultural and biological production systems, processing systems, and conservation of land and water resources. Education in mathematics, physics, and engineering sciences common to all engineering disciplines is provided along with specialized training in biological and agricultural sciences. The curriculum covers all areas of agricultural and biological engineering, including food engineering, postharvest handling and processing of commodities, power and machinery development and applications, resource management and utilization, soil and water management, and structures and their environmental modifications. A student can select the General Agricultural and Biological Engineering option or the Food Engineering option. The major is administered jointly by the Colleges of Agricultural Sciences and Engineering.

The goals and objectives of the Agricultural and Biological Engineering program include: (I) providing students with strong fundamental bases in engineering for entering professional engineering careers and/or graduate programs; (2) teaching students to apply engineering fundamentals and develop designs to solve engineering problems in agricultural and biological systems; (3) strengthening the students' abilities to communicate with others in all matters related to the profession and associated social responsibilities; (4) enabling students to develop the necessary skills to become lifelong learners; and (5) providing guidance in nurturing personal professional development, efficient work habits, integrity, willingness to accept responsibility, and leadership skills.

Design experiences are integrated throughout the curriculum by solving problems typical of those to be encountered in Agricultural and Biological Engineering, emphasizing the need to learn how technology affects societal values and structures, and developing an understanding of the humanities as well as technology. The design experiences emphasize that engineering professionals must learn not only how to create and use technology, but also to assess and manage the social and human consequences of that technology. The engineering design experiences culminate with a major design project in A B E 469W(3), the senior design capstone course.

Careers for graduates include design, development, and research engineering positions involving food processing, machinery development, irrigation and drainage, soil and water conservation, materials handling, and structural systems for animals, plants, and crop storage. Agricultural and biological engineers are employed in industry, consulting firms, and governmental agencies in the United States and abroad. Graduates deal with the various engineering aspects associated with production and processing of food, fiber, and other biological materials, within the constraints of environmental protection and natural resource conservation.

For the B.S. degree in Agricultural and Biological Engineering, a minimum of I30 credits is required. This baccalaureate program in Agricultural and Biological Engineering is accredited by the Engineering Accreditation Commission of ABET, Inc., I11 Market Place, Suite I050, Baltimore, MD 2I202-40I2; telephone 410-347-7700; or **www.abet.org**.

GENERAL EDUCATION: 45 credits
(21-22 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 106-107 credits
(This includes 21-22 credits of General Education courses: 0-1 credit of GHA courses; 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses; 3 credits of GWS courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 73 credits

PRESCRIBED COURSES (66 credits)
CHEM 012 GN(3), CHEM 014 GN(1), ED&G 100(3), E MCH 011(3)[1], MATH 140 GQ(4), MATH 141 GQ(4), PHYS 211 GN(4) (Sem: 1-2)
E MCH 012(3)[1], E MCH 013(3)[1], MATH 231(2), MATH 251(4), PHYS 212 GN(4) (Sem: 3-4)
A B E 400(3)[1], A B E 401(3)[1], A B E 402(3)[1], A B E 403(1.5)[1], A B E 404(3)[1], A B E 406(1.5)[1], ENGL 202C GWS(3) (Sem: 5-6)
E E 305(3)[1] (Sem: 5-8)
A B E 405(3)[1], A B E 469W(3), A B E 490W(1) (Sem: 7-8)

ADDITIONAL COURSES (7 credits)
Select 1 credit of First-Year Seminar (Sem: 1-2)
AG BM 101 GS(3), ECON 002 GS(3), or ECON 004 GS(3) (Sem: 3-4)
I E 424(3) or STAT 401(3) (Sem: 7-8)

REQUIREMENTS FOR THE OPTION: 33-34 credits

FOOD ENGINEERING OPTION: 34 credits

PRESCRIBED COURSES (26 credits)
M E 030(3)[1], NUTR 100 GHA(1.5) (Sem: 3-4)
B M B 211(3), M E 033(3)[1], M E 083(1), MICRB 201(3) (Sem: 5-6)
A B E 465(4), CHEM 034(3), FD SC 400(3), FD SC 408(2) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (8 credits)
Select 6 credits in any engineering science/design[26] (Sem: 7-8)
(Students may apply 6 credits of ROTC.)
Select 2 credits in food science[26] (Sem: 7-8)

GENERAL OPTION: 33 credits

PRESCRIBED COURSES (7 credits)
A B E 408(3)[1], C E 261(3)[1], C E 363(1) (Sem: 5-6)

ADDITIONAL COURSES (3 credits)
M E 023(3)[1] or M E 030(3) (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (23 credits)
Select 6 credits in engineering science/design[26] (Sem: 5-8)
Select 3 credits in natural/biological/agricultural science[26] (Sem: 7-8)
Select 8 credits in agricultural and biological engineering[26] (Sem: 7-8)
Select 6 credits in technical selection[26] (Sem: 7-8)
(Students may apply 6 credits of ROTC.)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
[26] Courses to be selected from a list approved by the Agricultural and Biological Engineering faculty. Courses must be chosen so that the Engineering Design and Engineering Science requirements for the major are met.

AGRIBUSINESS MANAGEMENT

College of Agricultural Sciences; The Smeal College of Business
Graduates can be found working in the food production, processing, financial services, wholesaling and retailing industries, both in the United States and abroad. A substantial number are employed by agricultural supply firms. Typically, B.S. degree holders begin their careers in sales or as management trainees, and then progress to

management as they develop higher levels of expertise and experience. Not all Penn State Agribusiness Management graduates have chosen careers in the food industry. Many also are employed in banking and the investment and mutual funds industries, and others have gone to law school, graduate school, or into rural development. The quality and diversity of the program enables Agribusiness majors to undertake a variety of jobs.

This major, which is offered jointly with Smeal College of Business, includes a core of courses required of all business administration students. Combining the required specialization area with a minor or electives also allows a student to focus on a particular area of interest.

For the B.S. degree in Agribusiness Management, a minimum of 120 credits is required.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

GENERAL EDUCATION: 45 credits
(15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 5 credits

REQUIREMENTS FOR THE MAJOR: 85 credits
(This includes 15 credits of General Education courses: 6 credits of GQ courses; 6 credits of GS courses; 3 credits of GWS courses.)

PRESCRIBED COURSES (63 credits)
ECON 004 GS(3), AG BM 102(3), AG BM 106(3)[1] (Sem: 1-4)
ACCTG 211(4), AG BM 302(3), AG BM 308W(3), AG BM 320(3), AG BM 338(3), CMPSC 203 GQ(4), M I S 204(2), MS&IS 200(4) (Sem: 3-4)
B A 301(2)[1], B A 302(3)[1], B A 303(2)[1], B A 304(2) (Sem: 5-6)
AG BM 408(3), AG BM 440(3), AG BM 460(3), B A 243(4) (Sem: 5-8)
ENGL 202D GWS(3) (Sem: 7-8)

ADDITIONAL COURSES (10 credits)
AG BM 101 GS(3)[1] or ECON 002 GS(3)[1] (Sem: 1-4)[77]
R SOC 011 GS(3) or SOC 001 GS(3) (Sem: 3-6)[78]
MATH 110 GQ(4) or MATH 140 GQ(4) (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 12 credits in a speciality area, in consultation with an adviser (at least 6 of these credits must be at the 300 or 400 level) (Sem: 5-8)

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
[77] AG BM 101 required unless ECON 002 was taken before entering the AG BM major.
[78] R SOC 011 required unless SOC 001 was taken before entering the AG BM major.

AGRICULTURAL AND EXTENSION EDUCATION

College of Agricultural Sciences

This major helps prepare students for positions in education in agriculture, including schools and colleges, Cooperative Extension, business, trade and professional associations, and government agencies. The department administers a program approved by the Pennsylvania Department of Education for the preparation of agriculture teachers in public school systems. This includes programs in agricultural production, mechanics, supplies, resources, products, forestry, horticulture, and other agricultural areas.

Students take courses in agricultural and natural resource sciences, leadership and communications, natural science, social science and general education. Students seeking teacher certification schedule professional courses in education and psychology.

Pennsylvania Teacher certification regulations require students to have a GPA of 3.0; pass a series of PRAXIS pre-certification teacher examinations; documentation of at least 80 hours of volunteer or paid education work experience with learners of the age group the candidate plans to teach. At least 40 of these age-appropriate 80 hours must be with learners whose cultural, social, or ethnic backgrounds differ from the

candidate's own; completion of an early field experience specified by the certification program; completion of at least 48 semester credit hours, including ENGL 015 or ENGL 030, 3 credits of literature, and 6 credits of quantification and secure occupational experience in the requested area of certification. (See also Teacher Education Programs.)

For students seeking teacher certification, the B.S. degree in Agricultural and Extension Education, a minimum of 125-129 credits is required. For students selecting the Leadership Development and Communications option, a minimum of 122 credits is required.

GENERAL EDUCATION: 45 credits
(13-22 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin for additional information)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 3-14 credits

REQUIREMENTS FOR THE MAJOR: 76-103 credits
(This includes 13-22 credits of General Education courses: 22 for the teacher certification options--6 credits of GS courses; 9 credits of GN courses; 4 credits of GQ courses; 3 credits of GWS courses; and 13 credits for the non-teacher certification option--6 credits of GS courses; 4 credits of GN courses; 3 credits of GWS courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 19 credits

PRESCRIBED COURSES (19 credits)
AG BM 101 GS(3), BIOL 110 GN(4), ENGL 202C GWS(3) (Sem: 3-4)
AEE 311(3), INTAG 100 GS;GI(3) (Sem: 5-6)
AEE 495(3) (Sem: 7-8)

REQUIREMENTS FOR THE OPTION: 57-84 credits

TEACHER CERTIFICATION OPTIONS

ENVIRONMENTAL SCIENCE OPTION: 84 credits

PRESCRIBED COURSES (47 credits)
AGRO 028(3), AN SC 001(4), ASTRO 001 GN(3), CHEM 011(3), CHEM 034(3), PHYS 001(3) (Sem: 1-2)
EDPSY 014(3)[1], EDTHP 115(3)[1], SPLED 400(3) (Sem: 2-7)
AEE 100(2), AEE 295(1)[1], SOILS 101 GN(3), STAT 200 GQ(4) (Sem: 3-4)
AEE 313(2)[1], AEE 412(4)[1], AEE 413(3)[1] (Sem: 5-8)

ADDITIONAL COURSES (7 credits)
BIOL 220W GN(4), BIOL 230W GN(4), or BIOL 240W GN(4) (Sem: 2-7)
A S M 101(3) or A S M 217(3) (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (30 credits)
Select 3 credits of W courses offered in the College (Sem:1-7)
Select 6 credits in biological, physical ecosystems (Sem: 1-7)
Select 6 credits in environmental impact management (Sem: 1-7)
Select 6 credits in environmental learning (Sem: 1-7)
Select 6 credits in social, political, and legal aspects of environmental science (Sem: 1-7)
Select 3 credits in agricultural systems management (Sem: 3-4)

PRODUCTION OPTION: 79 credits

PRESCRIBED COURSES (40 credits)
ASTRO 001 GN(3), CHEM 011(3), CHEM 034(3), PHYS 001 GN(3) (Sem: 1-2)
AEE 100(2), AEE 295(1)[1], STAT 200 GQ(4) (Sem: 3-4)
EDPSY 014(3)[1], EDTHP 115(3)[1], SPLED 400(3), SOILS 101 GN(3) (Sem: 2-7)
AEE 313(2)[1], AEE 412(4)[1], AEE 413(3)[1] (Sem: 5-8)

ADDITIONAL COURSES (4 credits)
BIOL 220W GN(4), BIOL 230W GN(4), or BIOL 240W GN(4) (Sem: 2-7)

SUPPORTING COURSES AND RELATED AREAS (35 credits)
Select 3 credits of W courses offered in the College (Sem:1-7)
Select 14 credits in agriculture (Sem: 1-7)
Select 6 credits in animal science (Sem: 1-7)
Select 6 credits in plant/soil science (Sem: 1-7)
Select 6 credits in agricultural systems management (Sem: 3-6)

NON-TEACHER CERTIFICATION OPTION

LEADERSHIP DEVELOPMENT AND COMMUNICATIONS OPTION: 57 credits

PRESCRIBED COURSES (9 credits)
AEE 360(3)[1], AEE 460(3)[1] (Sem: 5-6)
AEE 465(3) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS: (48 credits)
Select 3 credits of W courses offered in the College (Sem:1-7)
From an approved department list select the following:
Select 6 credits of communications courses in consultation with adviser (Sem: 1-8)
Select 6 credits of moral and ethical dimensions of leadership courses in consultation with adviser (Sem: 1-8)
Select 6 credits of leadership style courses in consultation with adviser (Sem: 1-8)
Select 6 credits of global and multicultural perspective courses in consultation with adviser (Sem: 1-8)
Select 3 credits of Animal Science courses in consultation with adviser (Sem: 1-8)
Select 3 credits of Soil and Plant Science courses in consultation with adviser (Sem: 1-8)
Select 3 credits of Agricultural Systems Management and/or Rural Sociology courses in consultation with adviser (Sem: 1-8)
Select 12 credits of Natural Resources courses in consultation with adviser (Sem: 1-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

AGRICULTURAL SCIENCE

College of Agricultural Sciences

This major enables students to develop programs of study to serve their individual needs by assembling courses selected from various departments within the College of Agricultural Sciences. The student develops either a broad background in agriculture or a special program of study not currently offered within departments of the college. Students are expected to focus study on one or more disciplines of the agricultural sciences by selecting a minor from the approved list of minors offered by the College of Agricultural Sciences. The student, in consultation with an adviser, is given considerable flexibility for selecting courses to satisfy individual interests and aspirations.

Students can prepare themselves for careers in agricultural and natural resource related sales, and /or public relations; food, agricultural and natural resource commodity groups, agricultural finance; governmental and conservation agencies; the Cooperative Extension Service; land use and appraisal; and international agriculture agencies.

For the B.S. degree in Agricultural Science, a minimum of 123 credits is required.

GENERAL EDUCATION: 45 credits
(16-30 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 6-26 credits (Sem: 1-7)

REQUIREMENTS FOR THE MAJOR: 82-88 credits
(This includes 16-30 credits of General Education courses: 0-3 credits of GA courses; 0-3 credits of GHA courses; 7-9 credits of GN courses; 0-6 credits of GS courses; 9 credits of GWS courses.)

PRESCRIBED COURSES (19 credits)
CAS 100 GWS(3), ENGL 015 GWS(3) (Sem: 1-2)
CHEM 012 GN(3), CHEM 014 GN(1) (Sem: 1-4)
AEE 311(3), AEE 360(3), AEE 460(3) (Sem: 5-8)

ADDITIONAL COURSES (30-33 credits)
BIOL 011 GN(3), and BIOL 012 GN(1), or BI SC 003 GN(3) (Sem: 1-2)
Select 3 credits from ENGL 202C GWS(3), ENGL 202D GWS(3) (Sem: 3-4)
Select 3 credits from AEE 330W(3), AEE 440(3) (Sem: 4-7)
Select 3-4 credits from A S M 101(3), AGRO 028(3), FORT 220(4) (Sem: 5-6)
Select 3 credits from AGESS 201(3), HORT 101 GN(3), SOILS 101 GN(3) (Sem: 5-6)
Select 3 credits from AG BM 101 GS(3), AG BM 200(3), AG EC 450 GI(3), INTAG 100 GS;GI(3), R SOC 011 GS(3), R SOC/WMNST 420 GI(3) (Sem: 5-6)
Select 3-4 credits from AN SC 001(4), AN SC 211(3), ENT 202 GN(3) (Sem: 5-6)
Select 3 credits from AEE 465(3), FD SC 105 GHA(3), FD SC 200(3), LARCH 060 GA(3), S T S 200 GS(3) (Sem: 5-6)
Select 3 credits from AGECO 134 GN(3), AGESS 201(3), W F S 209(3) (Sem: 5-6)
AEE 400(3) or INTAG 481(3) (Sem: 6-7)

SUPPORTING COURSES AND RELATED AREAS (33-36 credits)
Select 6 credits from natural science (Sem: 3-8)
Select 9 credits from plant science, soil science, food science, or A S M (Sem: 5-8)
Select 18-21 credits for College Ag Sciences Minor[1] (Sem: 5-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

AGRICULTURAL SYSTEMS MANAGEMENT

College of Agricultural Sciences

Career opportunities for the Agricultural Systems Management graduates exist in the production and management phases of agricultural enterprises. Graduates are employed as sales and field representatives, financial and technical consultants, and technical service or production personnel. Employment opportunities exist in the management and application of technology to power and machinery systems, soil and water systems, food production and processing systems, and agricultural structures and environmental systems.

This is an applied major that combines the study of agricultural sciences, engineering technology, natural resources, business, and management systems. The program is administered through the Department of Agricultural and Biological Engineering, which offers a series of courses to provide the technical background for the graduate. Basic study is emphasized in the agricultural and business management sciences, along with the application of the technical results of engineering research, design, and manufacturing. Graduates of this major apply their technology/management training to the diverse areas of food and fiber production, food processing, and management of land and water resources.

For the B.S. degree in Agricultural Systems Management, a minimum of 129 credits is required.

GENERAL EDUCATION: 45 credits
(24 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 6-7 credits

REQUIREMENTS FOR THE MAJOR: 101-102 credits
(This includes 24 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 6 credits of GS courses; 3 credits of GWS courses.)

PRESCRIBED COURSES (64 credits)
ACCTG 211(4), CHEM 012 GN(3), CHEM 014 GN(1), ECON 004 GS(3), ED&G 100(3)[1], MATH 110 GQ(4)[1], PHYS 250 GN(4)[1] (Sem: 1-2)
A S M 221(3)[1], AN SC 001(4), CMPSC 203GQ(4)[1], FIN 100(3) SOILS 101 GN(3) (Sem: 3-4)
A S M 310(3)[1], A S M 327(3)[1], A S M 422(3), A S M 425(3), B LOG 301(3), ENGL 202D GWS(3) (Sem: 5-6)
A S M 428(3), A S M 429W(3), A S M 490(1) (Sem: 7-8)

ADDITIONAL COURSES (19-20 credits)
AG BM 101 GS(3) or ECON 002 GS(3) (Sem: 3-4)
AG 301W(3) or B LAW 243(3) (Sem: 3-4)
BIOL 110 GN(4)[1] or BIOL 011 GN(3)[1] and BIOL 012 GN(1)[1] (Sem: 3-4)
MKTG 220(3) or MKTG 221(3) (Sem: 3-4)
STAT 200 GQ(4) or STAT 250 GQ(3) (Sem: 3-4)
AGRO 028(3) or HORT 101(3) (Sem: 5-6)

SUPPORTING COURSES AND RELATED AREAS (18 credits)
Select 3 credits in communications from department list (Sem: 5-6)
Select 9 credits in agriculture/biology from department list (Sem: 5-8)
Select 6 credits in business management from department list (Sem: 7-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

AGROECOLOGY

College of Agricultural Sciences

The coordinator position will rotate between faculty members in the Departments of Crop and Soil Sciences, Entomology, Horticulture, and Plant Pathology

Agroecology is concerned with the principles and practices applicable to the management of plant agroecosystems. There are two options: Integrated Crop Management (ICM) or Plant Science. Education in the Integrated Crop Management option emphasizes the principles of plant and soil management and the basic sciences upon which these principles are based. The Plant Science option requires additional emphasis in the basic sciences (mathematics, chemistry, physics, and biotechnology). The opportunity is available in either option to specialize in agronomy with emphasis on agronomic crops and conservation of soils; or horticulture with emphasis on horticultural crops; or entomology with emphasis on insects and their impact on the ecosystem; or plant pathology with emphasis on plant diseases. Students must develop, communicate, and apply technical information about plants, soils, environment, and production practices for food, feed, fiber, or ornamental crops. Business management skills can be developed by appropriate course selection in the ICM option.

Graduates in Agroecology have a wide choice of careers. Over 90% get jobs in service to the agricultural industry as farm managers, farm chemical and fertilizer store managers, sales representatives, field and laboratory technicians, crop management consultants, extension agents, soil and water conservationists and inspectors for various state and federal regulatory agencies. Some may return to the farm and become producers of farm products.

Those students who anticipate enrollment in graduate school should elect the Plant Science option while those preparing to enter the profession with a B.S. degree should select the Integrated Crop Management option.

For the B.S. degree in Agroecology, a minimum of 130 credits is required.

GENERAL EDUCATION: 45 credits
(27 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE:
(Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 1-4 credits

REQUIREMENTS FOR THE MAJOR: 108-111 credits
(This includes 27 credits of General Education courses: 9 credits of GN courses; 6 credits of GH courses; 6 credits of GQ courses; 3 credits of GS courses; 3 credits of GWS courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 67-68 credits

PRESCRIBED COURSES (51 credits)
BIOL 110 GN(4)[1], BIOL 220 GN(4)[1], BIOL 222 GN(3) (Sem: 1-4)
CHEM 012 GN(3)[1], CHEM 013 GN(3)[1], CHEM 014 GN(1), PHIL 010 GH(3), PHIL 104 GH(3) (Sem: 1-4)
CMPSC 203 GQ(3) (Sem: 3-4)
SOILS 101 GN(3)[1](Sem: 3-4)
AGESS 201(3), AGESS 460(3), AGESS 461(3) (Sem: 3-8)
AGRO 410W(4), AGRO 438A(5) (Sem: 5-8)
PPATH 405(3) (Sem: 5-6)

ADDITIONAL COURSES (16-17 credits)
AG BM 101 GS(3) or ECON 002 GS(3) (Sem: 1-4)
CHEM 034(3) or CHEM 038(4) (Sem: 1-4)
MATH 110 GQ(4) or MATH 140B GQ(4) (Sem: 1-4)
AGRO 028(3)[1] or HORT 101(3)[1](Sem: 3-4)
ENGL 202C GWS(3) or ENGL 202D GWS(3) (Sem: 7-8)

REQUIREMENTS FOR THE OPTION: 41-43 credits

INTEGRATED CROP MANAGEMENT OPTION: 41 credits

PRESCRIBED COURSES (14 credits)
BIOL 027 GN(3)[1] (Sem: 1-2)
AG ED 440(3) (Sem: 3-6)
AGECO 295(2), AGECO 495(2), AGESS 490(1) (Sem: 3-8)
SOILS 402(3) (Sem: 7-8)

ADDITIONAL COURSES (6 credits)
AGRO 423(3) and AGRO 425(3); or HORT 202(3) and HORT 315(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (21 credits)
Select 6 credits from insect biology and pest management (Sem: 5-6)
Select 6 credits from business-related course list (Sem: 3-8)
Select 9 credits from general course list (Sem: 3-8)

PLANT SCIENCE OPTION: 43 credits

PRESCRIBED COURSES (26 credits)
CHEM 015B(1), MATH 141B GQ(4) (Sem: 1-4)
BIOL 230W GN(4), B M B 251(3) (Sem: 5-6)
AGECO 495(2), AGESS 490(1), PHYS 250 GN(4), PHYS 251 GN(4) (Sem: 5-8)
STAT 250(3) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (17 credits)
Select 6 credits from insect biology and pest management (Sem: 5-6)
Select 11 credits from department science option list (Sem: 3-8)
[1]A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

AMERICAN STUDIES

Abington College; Commonwealth College; College of the Liberal Arts

This interdisciplinary major administered by the Department of English is designed to provide students with an integrated and critical knowledge of American culture, drawing on courses in American Studies and in the traditional disciplines and culminating in two senior seminars. A number of interests may be pursued within the major, including popular culture, art, technology, business, law, archives, museology, and conservation. The major helps prepare students for careers in business, teaching, government, and a number of other areas, and for enrollment in law and other professional programs.

For entrance into the major, the following criteria must be met: (1) At the end of the sophomore year, any student in good standing may gain entrance into the major without having completed specific courses. (2) Any student seeking entrance during the fifth semester will be granted entrance at the discretion of the American Studies Committee and/or Director following evaluation of the student's record. (3) Any student seeking entrance during or after the sixth semester will be expected to have completed at least 12 credits, which may be counted toward the major in American Studies.

For the B.A. degree in American Studies, a minimum of 123 credits is required.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE:
(Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 21 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 33 credits[1]

PRESCRIBED COURSES (6 credits)
AM ST 402W(6) (Sem: 5-8)

ADDITIONAL COURSES (3 credits)
AM ST 100 GH(3) or AM ST 100W GH(3) (Sem: 1-4)

SUPPORTING COURSES AND RELATED AREAS (24 credits)
(Include 12 credits at the 400 level distributed in at least two of the areas.)
Select 9 credits in each of two of the following areas; select 6 credits in one other of the areas: (Sem: 3-8)
a. American literature
b. American history
c. American art, philosophy, and religion (humanities)
d. American social sciences
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

AMERICAN STUDIES

Berks-Lehigh Valley: Penn State Berks, Penn State Lehigh Valley

The bachelor of arts degree in American Studies at Berks-Lehigh Valley College offers students a liberal arts education with a critical focus on the American experience. It provides students significant opportunities to explore American literature and history and to acquire an interdisciplinary perspective on the American experience through offerings in American Studies, communication arts and sciences, sociology, theatre, and other areas. Many of the courses in the program emphasize multicultural perspectives. Through course selection, internships, research projects, and study abroad opportunities, students are encouraged to individualize their major programs in ways that best serve their intellectual and vocational objectives.

Students are encouraged to meet with an adviser early in their academic program to design a program that will help them to meet their career goals, whether these include graduate school, law (or other professional) school, or other careers.

A minimum of 127 credits is required for the B.A. degree in American Studies.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 18 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)
REQUIREMENTS FOR THE MAJOR: 42 credits[1]

PRESCRIBED COURSES (21 credits)
HIST 020 GH(3), HIST 021 GH(3) (Sem: 1-2)
AM ST 100 GH(3) (Sem: 3-4)
ENGL 231W(3), ENGL 232W(3) (Sem: 3-6)
AMSTD 322 GI(3) (Sem: 5-6)
AMSTD 491W(3) (Sem: 7-8)

ADDITIONAL COURSES (21 credits)
Select 3 credits of Internship, Research, or Foreign Study from the following:
AM ST 395(1-18), AM ST 494(1-12), AM ST 499 GI(1-12) (Sem: 7-8)
Select 6 credits of Multicultural from the following:
AM ST 104 GH;GI(3), ENGL 135 GH;GI(3), ENGL 139 GH;GI(3), HIST 152 GH;GI(3), HIST 179 GH;GI(3), SOC 103 GI(3) (Sem: 1-4)
THEA 208 GA;GI(3) (Sem: 3-4)

Select 3 credits from the following:
AM ST 105 GH;GI(3), AM ST 140W GH;GI(3), PL SC 001 GS(3), SOC 001 GS(3) (Sem: 1-4)
ART H 307 GA(3) (Sem: 3-6)
Select 9 credits from the following:
AM ST 401(3), AMSTD 404(3), AMSTD 405(3), AMSTD 430 GI(3), HIST 458W(3), HIST 459W(3), HIST 467(3), HSTRY 481(3), ENGL 430(3), ENGL 431 GI(3), ENGL 434(3), ENGL 437(3), CAS 415(3), CAS 478(3), SOC 409 GI(3), SOC 432(3), THEA 405(3), THEA 412 GI(3) (Sem: 5-8)
AMSTD 491W(3)* (Sem: 7-8)
*may be repeated for up to 6 credits total
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

AMERICAN STUDIES

Capital College

American Studies is an interdisciplinary major that explores the patterns of life and thought of the American peoples, past and present. Its courses are grouped into three general areas of history, society, and culture, and it has special offerings in public history, material culture, and cultural history. The program encourages students to integrate theories, methods, and findings from various fields, including history, literature, folklore, ethnography, politics, art, architecture, and music. It also encourages applications of this knowledge to public history and cultural conservation, also known as "public heritage" work. The major helps students prepare for further study or careers in education, government, communication, law, museums, historical and cultural agencies, and archives. Internships are available for qualified students in American Studies. The internship is an extension of the student's academic studies and is an opportunity to gain practical experience.

For a B.Hum. degree in American Studies, a minimum of 120 credits is required.

ENTRY TO MAJOR REQUIREMENT: Entry to the American Studies major requires a 2.00 or higher cumulative grade-point average.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR.)

ELECTIVES: 18 credits

BACHELOR OF HUMANITIES DEGREE REQUIREMENTS: 18 credits
(See description of Bachelor of Humanities Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 39 credits
At least 12 credits must be at the 400 level.

PRESCRIBED COURSES (6 credits)[1]
AMSTD 302(3) (Sem: 5-8)
AMSTD 491W(3) (Sem: 7-8)

ADDITIONAL COURSES (18 credits)
A grade of C or better is required for at least 9 credits of Additional Courses[1]
a. Select 6 credits from AMSTD offerings in American history (AMSTD 320, AMSTD 400, AMSTD 401, AMSTD 402, AMSTD 404, AMSTD 405, AMSTD 412, AMSTD 417) (Sem: 5-8)
b. Select 6 credits from AMSTD offerings in American society (AMSTD 321, AMSTD 322, AMSTD 323, AMSTD 324, AMSTD 325, AMSTD 430, AMSTD 431, AMSTD 435, AMSTD 439, AMSTD 441, AMSTD 448, AMSTD 449) (Sem: 5-8)
c. Select 6 credits from AMSTD offerings in American culture (AMSTD 363, AMSTD 460, AMSTD 461, AMSTD 462, AMSTD 472, AMSTD 475, AMSTD 476, AMSTD 479) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (15 credits)
Select 15 credits from any American Studies offerings (AMSTD or AMST, and choices from the American Studies Program approved list) (Sem: 5-8)

These credits may be applied to a Capital College minor in support of the student's interests after consultation with the student's academic adviser from the major and the coordinator of the minor.
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

ANIMAL BIOSCIENCE

College of Agricultural Sciences

Cooperating Departments: Animal Sciences, Poultry Science, and Veterinary Science

This major provides a strong background in those biological and physical sciences underlying contemporary animal agriculture and establishes a sound foundation for graduate-level study in animal and related sciences. The student is expected to focus on one or more disciplines of the biological sciences related to animal agriculture during the senior year. Such disciplines may include animal behavior, genetics, nutrition, and physiology.

The mission of the Animal Bioscience major is to prepare students for admission to veterinary school and/or entry into graduate programs in animal biosciences. Students may prepare for graduate programs such as genetics, nutrition, microbiology, animal sciences, physiology, biochemistry, or others.

For the B.S. degree in Animal Bioscience, a minimum of 130 credits is required.

GENERAL EDUCATION: 45 credits
(18 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 16-21 credits

REQUIREMENTS FOR THE MAJOR: 82-87 credits
(This includes 18 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses.)

PRESCRIBED COURSES (46 credits)
BIOL 110 GN(4), CHEM 012 GN(3), CHEM 013 GN(3), CHEM 014 GN(1), CHEM 015 GN(1), MATH 140 GQ(4), MATH 141 GQ(4) (Sem: 1-2)
PHYS 215 GN(4), PHYS 265 GN(4) (Sem: 3-6)
AN SC 001(4)[1], AN SC 301(3)[1], BIOL 222(3)[1] (Sem: 3-4)
MICRB 201(3), MICRB 202(2) (Sem: 5-6)
V SC 303(3)[1] (Sem: 7-8)

ADDITIONAL COURSES (27-32 credits)
Select 4 credits from BIOL 220W GN(4), BIOL 230W GN(4), or BIOL 240W GN(4) (Sem: 1-4)
Select 6-9 credits from CHEM 034(3), CHEM 035(3); or CHEM 036(2), CHEM 038(4), CHEM 039(3) (Sem: 3-6)
Select 2-4 credits from CMPSC 100(3), CMPSC 101 GQ(3), AG 200A(2), AG 200B(2), STAT 200(4), STAT 240(3), or STAT 250(3) (Sem: 3-4)
AN SC 423(3) or BIOL 472(3) (Sem: 5-6)
Select 3 credits from ECON 002 GS(3), ECON 004 GS(3), or AG EC 101 GS(3) (Sem: 5-6)
Select 6 credits from B M B 211(3), B M B 212(1), B M B 221(2); or B M B 401(2), B M B 402(3) (Sem: 5-6)
Select 3 credits from AN SC 305(3), AN SC 306(3), AN SC 309(3), AN SC 310(3), AN SC 311(3), AN SC 327(3), V SC 405(3) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 9 credits of 400-level courses from department list (must include 3 credits of a grade of C or better[1]) (Sem: 7-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

ANIMAL SCIENCES

College of Agricultural Sciences

Cooperating Departments: Dairy and Animal Science and Poultry Science

Animal Science may be defined as the study and integration of all disciplines that relate to the function and care of animals for the benefit of humankind by providing companionship, food, fiber, and research. The Animal Sciences major includes references to all types of animals.

The educational experiences included in this major should prepare the student for a wide range of entry-level positions in production agriculture agribusiness, and allied industries, and provide preparation for the pursuit of

postbaccalaureate studies leading to professional or advanced degrees. The student is expected to develop a comprehensive understanding of the biological and physical sciences underlying the functioning of all types of animals.

Realizing the wide range of career possibilities requiring diverse types of academic preparation, two options of study are available: the Business/Management Option and the Science Option.

For the B. S. degree in Animal Sciences, a minimum of 125 credits is required.

BUSINESS/MANAGEMENT OPTION: The primary objective of this option is to prepare the student for entry-level positions in agribusiness organizations and in the animal and food industries. The student may develop a program with specie specialization or diversity. The student may develop a foundation in accounting, economics, finance, marketing, and other business-related areas. Graduates seek entry-level employment opportunities as loan officers with financial institutions; technical service and sales representatives for pharmaceutical, agri-chemical, feed or food producing companies; field representatives for breed organizations or producer cooperatives; public relations personnel for agribusiness companies; management trainees for numerous agribusiness firms; and management trainees or assistant managers of animal production units.

SCIENCE OPTION: The primary objective of this option is to prepare the student for entry into post-baccalaureate study programs in the animal and related sciences. Graduates who have obtained the proper qualifications may pursue advanced studies in a wide variety of disciplines, including animal science, biotechnology, genetics, microbiology, nutrition, physiology, operations research, and veterinary medicine. Graduates not desiring to pursue advanced studies seek entry-level employment opportunities as research technicians, technical service representatives for various industrial companies, food inspectors, laboratory animal caretakers, and public relations personnel.

GENERAL EDUCATION: 45 credits
(18-21 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 2-14 credits

REQUIREMENTS FOR THE MAJOR: 87-96 credits
(This includes 18-21 credits of General Education courses: 0-3 credits of GA courses; 9 credits of GN courses; 3 credits of GS courses; 6 credits of GQ courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 38-45 credits

PRESCRIBED COURSES (22 credits)
AN SC 001(4)[1], AN SC 207(2)[1], AN SC 208(1)[1], AN SC 290W(1), AN SC 300 GN(3)[1], CHEM 034(3) (Sem: 3-4)
AN SC 301(3)[1], AN SC 490(1), B M B 211(3) (Sem: 3-6)
AN SC 400(1) (Sem: 7-8)

ADDITIONAL COURSES (13-18 credits)
AG BM 101 GS(3) or ECON 002 GS(3) (Sem: 1-2)
Select 6-8 credits from:
—Select 3-4 from MATH 021 GQ(3), MATH 022 GQ(3), MATH 110 GQ(4), or MATH 140 GQ(4) (Sem: 1-2)
—Select 2-4 from CMPSC 101 GQ(3), CMPSC 203 GQ(4), MATH 022 GQ(3), MATH 111 GQ(2), MATH 141 GQ(4), STAT 100 GQ(3), STAT 200 GQ(4), or STAT 250 GQ(3) (Sem: 1-2)
—Select 3 credits)[1] from AN SC 305(3), AN SC 306(3), AN SC 308(3), AN SC 309(3), AN SC 310(3), AN SC 311(3), or AN SC 327(3) (Sem: 5-6)
—Select 1-4 credits from AN SC 406(1), AN SC 407(3), AN SC 409(2), AN SC 410(4), or AN SC 411(2) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (3-5 credits)
Select 3-5 credits in writing and speaking skills courses from department list. Certain courses may double count as general education courses; consult with your adviser. (Sem: 7-8)

REQUIREMENTS FOR THE OPTION: 49-51 credits

BUSINESS/MANAGEMENT OPTION: 50-51 credits

PRESCRIBED COURSES (10 credits)
CHEM 011(3) (Sem: 1-2)
ACCTG 211(4) (Sem: 3-4)
AN SC 322(3) (Sem: 5-6)

ADDITIONAL COURSES (17-18 credits)
BIOL 011 GN(3), BIOL 012 GN(1); or BIOL 110 GN(4) (Sem: 1-4)
AG EC 102(3) or MKTG 221(3) (Sem: 3-4)
AG BM 200(3) or MGMT 100(3) (Sem: 3-4)
MICRB 106 GN(3), MICRB 107 GN(1); or MICRB 201(3), MICRB 202(2) (Sem: 5-6)
Select 3 credits from AN SC 305(3), AN SC 306(3), AN SC 308(3), AN SC 309(3), AN SC 310(3), AN SC 311(3), or AN SC 327(3) (Sem: 5-6)

SUPPORTING COURSES AND RELATED AREAS (23 credits)
Select 23 credits (at least 9 credits of business and 9 credits of production courses; 12 credits must be 400-level courses) from department list (Sem: 5-8)
(Students may apply 6 credits of ROTC.)

SCIENCE OPTION: 49-51 credits

PRESCRIBED COURSES (34 credits)
CHEM 012 GN(3), CHEM 013 GN(3), CHEM 014 GN(1), CHEM 015 GN(1) (Sem: 1-2)
BIOL 110 GN(4), CHEM 035(3) (Sem: 3-4)
B M B 212(1), B M B 221(2) (Sem: 5-6)
MICRB 201(3), MICRB 202(2), PHYS 250 GN(4) (Sem: 5-6)
AN SC 423(3), AN SC 431W(4) (Sem: 7-8)

ADDITIONAL COURSES (10 credits)
BIOL 220W GN(4), BIOL 230W GN(4), or BIOL 240W GN(4) (Sem: 3-4)
AGRO 028(3) or SOILS 101 GN(3) (Sem: 5-6)
AN SC 322(3), BIOL 033 GN(3), or BIOL 222(3) (Sem: 5-6)

SUPPORTING COURSES AND RELATED AREAS (5-7 credits)
Select 5-7 credits of 400-level courses from department list
(Students may apply 6 credits of ROTC.) (Sem: 7-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

ANTHROPOLOGY

College of the Liberal Arts
For B.A. degree in Anthropology, a minimum of 121 credits is required.

GENERAL EDUCATION: 45 credits
(4 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR.)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in ELECTIVES, GENERAL EDUCATION course selections, or REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 16 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 40 credits[1]
(This includes 4 credits of General Education GQ courses.)

PRESCRIBED COURSES (13 credits)
ANTH 002 GS(3), ANTH 021 GN(3), ANTH 045 GS;DF(3), STAT 200 GQ(4) (Sem: 1-6)

ADDITIONAL COURSES (27 credits)
Select 15 credits in ANTH courses other than ANTH 001 GS;GI(3) (no more than 6 credits from 190-199, 290-299, 390-399, and 490-499, other than 297 and 497) (Sem: 1-8)
Select 12 credits from the following ranges (at least 3 credits must be in each range):
a. Archaeology: ANTH 420-439 (Sem: 3-6)
b. Biological anthropology: ANTH 400-419, ANTH 460-473 (Sem: 3-6)
c. Cultural anthropology: ANTH 440-459, ANTH 474-479 (Sem: 3-6)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

APPLIED BEHAVIORAL SCIENCE

Capital College

This Applied Behavioral Science major helps students prepare for careers that provide direct service to individuals in need of assistance. These careers are in a variety of human services both in the public and private sectors or in personnel-related positions such as human resources.

Graduates may also pursue advanced degrees in fields such as community psychology and counseling. The strengths of the program include: internships directly related to the student's area of interest, flexibility in course selection that allows students to focus on particular interests, a solid foundation of knowledge on which to build skills, and skill development courses.

For a B.S. degree in Applied Behavioral Science, a minimum of 122 credits is required.

ENTRY TO MAJOR REQUIREMENTS: Entry to the Applied Behavioral Science major requires a 2.00 or higher cumulative grade-point average.

CHANGE-OF-ASSIGNMENT RECOMMENDATION: Students should generally have completed most of their General Education requirements. A limited number of 001-200 level courses are offered at Penn State Harrisburg for students who need lower division courses.

Students should request a change-of-assignment to Penn State Harrisburg during their fourth semester, to be effective for the next semester of enrollment.

NOTE: Options were added after the print deadline. See: www.psu.edu/bulletins/bluebook

GENERAL EDUCATION: 45 credits
(3 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education Course Requirements in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 3-12 credits

REQUIREMENTS FOR THE MAJOR: 68-77 credits
(This includes 3 credits of General Education courses: 3 credits of GS courses)

PRESCRIBED COURSES (17-26 credits)
SCLSC 320(4)[1], BE SC 395(3-12)[1] (Sem: 5-8)
BE SC 472(4)[1], PSYC 482(3)[1] (Sem: 5-8)
HD FS 312W(3) (Sem: 5-8)

ADDITIONAL COURSES (24 credits)
Select 3 credits from: PSY 002 GS(3) or SOC 001GS(3) (Sem: 1-4)
Select 3 credits from: PSYC 403(3), PSYC 405(3), PSYC 406(3), or HDFS 229 GS(3) (Sem: 4-8)
Select 3 credits from: BE SC 370(3) or SOCIO 384(3) (Sem: 5-8)
Select 3 credits from: BE SC 407(3), BE SC 408(3), BE SC 410(3), BE SC 459(3), or PSYC 421(3) (Sem: 5-8)
Select 6 credits from: BE SC 461(3); PSYC 415(3); SOCIO 372(3) or SOCIO 440(3) (Sem: 5-8)
Select 3 credits from: AFRAS 412 GI(3), PSYC 465 DF(3), SOCIO 463(3), SOCIO 484(3), or SOCIO 486(3) (Sem: 5-8)
Select 3 credits from: BE SC 376(3), BE SC 468(3), or SOCIO 462 DF(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (27 credits)
(At least 2 credits of Supporting Courses must be at the 400 level.)
Select 6 credits from: CRIMJ or PUBPL (Sem: 5-8)
Select 6 credits from: AMSTD, C ART, C HIS, C MUS, ENLSH, HCOMM, HUM, LIT, PHLOS, THTRE (Sem: 5-8)
Select 15 credits in consultation with an academic advisor and in support of the student's interests (Sem: 5-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

APPLIED PSYCHOLOGY

Berks-Lehigh Valley College (APSYC): Penn State Berks, Penn State Lehigh Valley
Commonwealth College (APSCC): Penn State New Kensington, Penn State McKeesport, Penn State Beaver

This major is designed for students who are interested in a liberal arts degree with a concentration in applied psychology. The program features both active and collaborative classroom experiences in addition to intensive internship experiences, and is most appropriate for students who wish to develop a set of applied scientific and human relations skills that will prepare them for entry-level employment in a wide range of government and private human service organizations and agencies, and in business and industry. Because of the flexible and broad nature of the degree, students might also use this major as a preparation for graduate or professional school in business, human services, law, or the social sciences.

This program differs most notably from traditional majors in psychology in three ways: 1) it is intended for students who may not be planning to pursue a doctoral degree in psychology that would prepare them for a career as a psychologist; 2) it requires that students learn and apply skills during 12 credits of internship experiences; 3) it requires that students demonstrate skill proficiency in a comprehensive assessment in order to graduate.

For the B.A. degree in Applied Psychology, a minimum of 127 credits is required.

GENERAL EDUCATION: 45 credits
(0-4 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 8-24 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 12-24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 50 credits[1]
(This includes 0-4 credits of General Education GQ courses.)

PRESCRIBED COURSES (28 credits)
PSY 002 GS(3) (Sem: 1-2)
PSY 213 GS(3), PSY 296(1) (Sem: 1-4)
PSY 201W(4) (Sem: 3-6)
PSY 450/EDPSY 450(3), PSY 495(12) (Sem: 5-8)
PSY 496(2) (Sem: 7-8)

ADDITIONAL COURSES (16 credits)
PSY 015(4) or STAT 200 GQ(4) (Sem: 3-4)
Select 12 credits from the following groups, including a minimum of 3 credits from each category (a total of 9 credits must be at the 400 level):
a. Abnormal, Clinical, Personality:
PSY 238 GS(3) (Sem: 3-6)
PSY 412(3), PSY 471 GI(3), PSY 482(3) (Sem: 5-8)
b. Developmental, Cognitive, Learning:
ED PSY 014(3), PSY 204 GS(3), PSY 221 GS(3), PSY 421(3), PSY 425(3), PSY 426(3) (Sem: 3-6)
PSY 445/HD FS 445(3) (Sem: 5-8)
c. Industrial/Organizational, Social, Interpersonal:
PSY 217 GS(3), PSY 231 GS(3), PSY 417 GI(3) (Sem: 3-8)
PSY 475(3), PSY 477(3) (Sem: 5-8)
d. Health, Wellness, Adjustment:
PSY 243 GS(3) (Sem: 3-6)
PSY 437(3), PSY 487(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 3 credits of 200-level psychology in consultation with an adviser (Sem: 1-2)
Select 3 credits in consultation with an adviser (Sem: 1-8)
[1]A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

ARCHAEOLOGICAL SCIENCE

College of the Liberal Arts

(The Bachelor of Science degree in Archaeological Science is offered by the Archaeology program in the Department of Anthropology.)

This degree provides the opportunity to develop a strong foundation in research methods, quantification, field methods, and laboratory science. It prepares students with the skills and competencies needed to pursue careers in cultural resource management. Students contemplating futures in nonacademic archaeology should consider this degree or some of its recommended courses.

For the B.S. degree in Archaeological Science, a minimum of 123 credits is required.

GENERAL EDUCATION: 45 credits
(11 of these 45 credits are included in REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 9 credits

REQUIREMENTS FOR THE MAJOR: 80 credits[1]
(This includes 11 credits of General Education courses: 4 credits of GQ courses; 4 credits of GN courses; 3 credits of GH courses.)

PRESCRIBED COURSES (55 credits)
ANTH 002 GS(3), ANTH 011 GS;GI(3), ANTH 021 GN(3), ANTH 045 GS;GI(3), ANTH 285 GS;GI(3), ANTH 321W(3), ANTH 380(3), ANTH 423(3), ANTH 428(3), ANTH 456(3), 3 credits from ANTH 492(3-6), 3 credits from ANTH 493(3-6), GEOG 121 GS(3), GEOG 357(3), GEOSC 001(3), SOILS 101 GN(3), STAT 200 GQ(4), STAT 460(3) (Sem: 1-6)

ADDITIONAL COURSES (25 credits)
Select 3 credits from ANTH 146 GS;GI(3) or ANTH 152(3) (Sem: 3-8)
Select 4 credits from the following: BIOL 110 GN(4), CHEM 012 GN(3), CHEM 013 GN(3), CHEM 014 GN(l), or CHEM 015 GN(l) (Sem: 3-8)
Select 3 credits from the following: PHIL 011 GH(3), PHIL 116 GH(3), PHIL 132 GH(3), or PHIL 221 GH(3) (Sem: 3-8)
Select 3 credits from GEOSC 340(3) or GEOSC 418/SOILS 419(3) (Sem: 3-8)
Select 3 credits from ANTH 410(3) or ANTH 411(3) (Sem: 3-8)
Select 3 credits in consultation with adviser from the following ranges: ANTH 320-329 or ANTH 420-429 (Sem: 3-8)
Select 6 credits in consultation with adviser either in ANTH electives other than ANTH 001, ANTH 492, and ANTH 493, or carry out a senior project under ANTH 496(6) (Sem: 3-8)
NOTE: Internships will be counted as elective credits.
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

ARCHITECTURAL ENGINEERING

College of Engineering

This major emphasizes the application of scientific and engineering principles to the planning, design, and construction of buildings and building systems. The goal of the program is to provide engineering graduates with the best education available for careers in the building professions. Graduates will have the ability to practice as registered professional engineers in a variety of areas, both public and private, related to the planning, design, construction, and operation of buildings and to assume a place of leadership in society.

Four options are available in the ten-semester major: the Construction option, which emphasizes building construction engineering and construction management; the Lighting/Electrical option, which emphasizes the design of lighting and electrical systems for buildings; the Mechanical option, which emphasizes the design of heating, ventilating and air-conditioning systems in buildings; and the Structural option, which emphasizes the analysis and design of building structural systems. Courses in architectural design are included in all options to give the engineering student an understanding of architectural design and its relation to engineering. Courses in engineering design are provided throughout the program. The design experience is culminated in a year-long capstone design course. The major is accredited by the Accreditation Board for Engineering and Technology.

A limited number of undergraduate students in the B.A.E. program will be considered for admission to the integrated undergraduate/graduate program leading to the B.A.E. and the M.A.E. degrees. Students who are

currently enrolled in the 7th semester of the B.A.E degree program may be admitted to the integrated B.A.E./M.A.E. program, following a positive review of an application specific to this program by the faculty committee on graduate admissions. Students must have attained a GPA of at least 3.0 and must have attained a grade of C or better in all classes listed as A E. Students admitted to the integrated program must maintain a GPA in all classes used toward the M.A.E. degree of at least 3.0.

The professional degree, Bachelor of Architectural Engineering, is granted upon the satisfactory completion of the five-year program.

For the B.A.E. degree in Architectural Engineering, a minimum of 168 credits is required. This baccalaureate program in Architectural Engineering is accredited by the Engineering Accreditation Commission of ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202-4012; telephone 410-347-7700; or **www.abet.org**.

For the integrated B.A.E./M.A.E. degrees, a minimum of 180 credits of course work is required.

GENERAL EDUCATION: 45 credits
(27 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 150 credits
(This includes 27 credits of General Education courses: 9 credits of GN courses; 6 credits of GA courses; 6 credits of GQ courses; 3 credits of GS courses; 3 credits of GWS courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 106 credits

PRESCRIBED COURSES (99 credits)
CHEM 012 GN(3), CHEM 014 GN(1), E G 130(3), MATH 140 GQ(4), MATH 141 GQ(4), PHYS 211 GN(4)[1] (Sem: 1-2)
A E 202(3), A E 221(2), A E 222(3), ARCH 130A(6), E MCH 011(3), E MCH 013(3), MATH 220 GQ(2), MATH 231(2), PHYS 212 GN(4), PHYS 213 GN(2) (Sem: 3-4)
A E 308(4)[1], A E 309(2), A E 310(3)[1], A E 311(3)[1], A E 372(3)[1], A E 401(3), ARCH 210 GA(3), ARCH 211 GA(3), E E 220(3), E MCH 012(3), M E 023(3), MATH 250(3), STAT 401(3) (Sem: 5-6)
A E 402(3), ARCH 441(4), ARCH 443(1) (Sem: 7-8)
ENGL 202C GWS(3) (Sem: 9-10)

ADDITIONAL COURSES (7 credits)
Select A E 124S(1) or 1 credit of another First-Year Seminar (Sem: 1-2)
ECON 002 GS(3), ECON 004 GS(3), or ECON 014 GS(3) (Sem: 1-2)
CMPSC 201C GQ(3) or CMPSC 201F GQ(3) (Sem: 3-4)

REQUIREMENTS FOR THE OPTION: 44 credits

CONSTRUCTION OPTION: 44 credits

PRESCRIBED COURSES (27 credits)
A E 475(3), A E 476(3), ACCTG 211(4), C E 336(4), MGMT 321(3)[19] (Sem: 7-8)
A E 480W(4), A E 482C(4), C E 209(2) (Sem: 9-10)

SUPPORTING COURSES AND RELATED AREAS (17 credits)
Select 6 credits from technical courses on department list[19] (Sem: 7-8)
Select 7 credits from technical courses on department list (Sem: 9-10)
Select 4 credits of geotechnical courses (Sem: 9-10)

LIGHTING/ELECTRICAL OPTION: 44 credits

PRESCRIBED COURSES (30 credits)
A E 454(3), A E 461(3), A E 467(3), E E 365(3), ARCH 442(4)[19] (Sem: 7-8)
A E 464(3), A E 466(3), A E 481W(4), A E 482B(4) (Sem: 9-10)

SUPPORTING COURSES AND RELATED AREAS (14 credits)
Select 3 credits from technical courses on department option list [19] (Sem: 7-8)
Select 8 credits from technical courses on department option list (Sem: 9-10)
Select 3 credits from engineering science courses on department option list (Sem: 9-10)

MECHANICAL OPTION: 44 credits

PRESCRIBED COURSES (30 credits)
A E 454(3), A E 455(3), A E 467(3) ARCH 442(4)[19], M E 033(3), M E 412(3) (Sem: 7-8)
A E 458(3), A E 481W(4), A E 492B(4) (Sem: 9-10)

SUPPORTING COURSES AND RELATED AREAS (14 credits)
Select 3 credits from technical courses on department option list[19] (Sem: 7-8)
Select 11 credits from technical courses on department option list (Sem: 9-10)

STRUCTURAL OPTION: 44 credits

PRESCRIBED COURSES (32 credits)
A E 403(3), A E 430(3), A E 475(3), ARCH 442(4)[19], E MCH 215(2), E MCH 216(1) (Sem: 7-8)
A E 431(3), A E 439(3), A E 481W(4), A E 482A(4), C E 209(2) (Sem: 9-10)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 3 credits from technical courses on department option list (Sem: 7-8)
Select 5 credits from technical courses on department list[19] (Sem: 7-8)
Geotechnical selection(4) (Sem: 7-8)
Note: The following substitutions are allowed for students attending campuses where the indicated course is not offered: ED&G 100(3) can be substituted for E G 130(3).
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
[19] Students may apply 6 credits of ROTC.

ARCHITECTURE, B.S, B.ARCH.

College of Arts and Architecture

The Department of Architecture is a member of the Association of Collegiate Schools of Architecture and is accredited by the National Architectural Accrediting Board. The major provides for the education of architects at the preprofessional and professional levels.

The professional program (BARCH) is a five-year curriculum leading to the Bachelor of Architecture degree requiring 165 credits and contains additional intensive academic studies in architectural and related subjects required for professional development. This program prepares those who seek careers as practicing architects. It is also professional preparation for those entering related design fields. Graduates holding a Bachelor of Architecture first professional degree are eligible, after appropriate internship experience, for admission to the professional state licensing examination, and subsequent registration as architects.

The preprofessional program (ARCBS) is a four-year curriculum leading to the Bachelor of Science degree with a major in Architecture requiring 135 credits. The curriculum consists of a foundation core of design, introductory studies in architecture and environmental design at various scales, programming and implementation techniques, architectural data systems application, architectural theories in design and methodology, and research. This program helps prepare those who intend to enter related environmental design professions. Bachelor of Science graduates are trained and eligible for immediate participation as paraprofessionals in the environmental design field, may continue their studies in intensive and specialized professional training for the first professional degree, or may continue with further graduate studies.

Architecture students are reviewed at the end of the fourth semester (second year) for retention in the program. A portfolio of architectural design work examples will be submitted by each student and evaluated by a committee of faculty members. The review will be based on criteria which evaluates growth over the four-semester period and architectural design competence as evidenced in the architectural design work examples presented in the student's portfolio. A positive review will permit the student to continue in the major. A negative review will not permit continuance in the Architecture program. For students who receive a negative review, every effort will be made to advise them into a related discipline.

At the end of the fourth year (135 credits completed), students are reviewed for retention in the five-year BARCH program. This review evaluates a student's performance by reviewing the overall University grade-point average which must be a minimum of 2.5 and the student's performance in architectural design studio courses where the minimum grade-point average must be 2.67 on the 4.0 scale. In cases where either of these minimums are not met, a portfolio of design work examples will be requested of the student and reviewed by the committee. In cases where retention in the BARCH (five-year) program is not permitted, students having already completed the ARCBS (four-year, 135 credits) requirements will be given a "change of major" and awarded the Bachelor of Science degree in architecture. Students may also elect to leave Penn State after completing the requirements of the four-year (ARCBS) program and receive the Bachelor of Science degree.

For the B.Arch. degree in Architecture, a minimum of 165 credits is required. For the B.S. degree in Architecture, a minimum of 135 credits is required.

Bachelor of Science
GENERAL EDUCATION: 45 credits
(6 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 1 credit

REQUIREMENTS FOR THE MAJOR: 95 credits[1]
(This includes 6 credits of General Education GA courses.)

PRESCRIBED COURSES (80 credits)
A E 210(3), ARCH 110(3), ARCH 111(3), ARCH 121(2), ARCH 122(2), ARCH 131S(3), ARCH 132(3), ART H 211 GA(3) (Sem: 1-2)
A E 421(3), A E 422(3), ARCH 203(3), ARCH 204(3), ARCH 231(5), ARCH 232(5), ARCH 281(3), ART H 212 GA(3), ART H 213 GA(3) (Sem: 3-4)
A E 211(3), A E 424(3), ARCH 331(6), ARCH 332(6), ART H 214 GA(3) (Sem: 5-6)
ARCH 311W(3), ARCH 499B DF(3) (Sem: 7-8)

ADDITIONAL COURSES (12 credits)
ARCH 431(6), ARCH 432(6); or ARCH 431(6) or ARCH 432(6) and ARCH 499A DF(6) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (3 credits)
Select 3 credits in art (Sem: 3-6)

Bachelor of Architecture
GENERAL EDUCATION: 45 credits
(6 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 13 credits

REQUIREMENTS FOR THE MAJOR: 113 credits[1]
(This includes 6 credits of General Education GA courses.)

PRESCRIBED COURSES (98 credits)
A E 210(3), ARCH 110(3), ARCH 111(3), ARCH 121(2), ARCH 122(2), ARCH 131S(3), ARCH 132(3), ART H 211 GA(3) (Sem: 1-2)
A E 421(3), A E 422(3), ARCH 203(3), ARCH 204(3), ARCH 231(5), ARCH 232(5), ARCH 281(3), ART H 212 GA(3), ART H 213 GA(3) (Sem: 3-4)
A E 211(3), A E 424(3), ARCH 331(6), ARCH 332(6), ART H 214 GA(3) (Sem: 5-6)
ARCH 311W(3), ARCH 499B DF(3) (Sem: 7-8)
ARCH 451(3), ARCH 480(3), ARCH 491(6), ARCH 492(6) (Sem: 9-10)

ADDITIONAL COURSES (12 credits)
ARCH 431(6), ARCH 432(6); or ARCH 431(6) or ARCH 432(6) and ARCH 499A DF(6) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (3 credits)
Select 3 credits in art (Sem: 3-6)

Integrated BARCH-MSARCH Program
The Department of Architecture offers a limited number of academically superior students enrolled in the fourth year of the program leading to the Bachelor of Architecture degree the opportunity to enroll in an integrated program leading to both the Bachelor of Architecture and the Master of Science in Architecture degrees. The

program permits the student to integrate the fifth year of study for the professional BARCH degree with the program of study for the MSARCH degree into a continuous program of study culminating in both degrees. The ability to coordinate as well as concurrently pursue the two degree programs enables the student to achieve greater depth and comprehensiveness than if the degrees are pursued sequentially and to earn the two degrees in a shorter period. In particular, the program encourages the student to integrate the undergraduate thesis design project with the master's thesis, thereby achieving a greater depth of inquiry.

The number of openings to this special program is limited; admission is by invitation of the faculty and is extremely selective.

Admission Requirements

Applicants to the integrated program must be enrolled in the fourth year of a BSARCH program or otherwise qualified to apply for admission to the fifth year of the BARCH program at Penn State. To be admitted, applicants must be able to meet the following requirements:

—Must have completed a B.S.Arch., or other degree qualifying for admission to the BARCH program, prior to entry into the Integrated Degree program.

—Must be unconditionally accepted into the fifth year of the BARCH program at Penn State.

—Must be unprovisionally accepted into the MSARCH program at Penn State (see application requirements for the MSARCH degree in the Penn State Graduate Degree Programs Bulletin).

—Must have a minimum 3.20 junior/senior overall grade-point average (on a 4.0 scale) as well as: (1) a minimum 3.20 GPA in architectural design courses (studio), and (2) a minimum 3.20 GPA in all course work except architectural design courses (studio).

—In addition to the normal application requirements for the M.S.Arch. degree, the student applicant shall provide a Plan of Study of not more than 1,500 words. The plan shall clearly describe the student's proposed general thesis topic and a strategy for pursuing it, including a list of proposed courses and a list of faculty whom the student foresees as contributing to the course of study.

The best-qualified students will be accepted up to the number of spaces available for new students. Acceptance to the program prior to the completion of all required course work is provisional, contingent upon meeting the previous requirements.

ART, B.A.

College of Arts and Architecture

The B.A. degree in art provides a comprehensive liberal education coupled with professional resident instruction in art. Depending on each student's objectives and course choices, this degree provides preparation for a professional career, a foundation for graduate studies, or a liberal arts education in art. Each student must elect an area of concentration from one of the following: ceramic arts, drawing and painting, graphic design, metals, photography, printmaking, or sculpture.

For a B.A. degree in Art, a minimum of 123 credits is required.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 6 credits

COLLEGE BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 48 credits

PRESCRIBED COURSES (12 credits)[1]
ART 110S(3), ART 111(3), ART 120(3), ART 122W(3) (Sem: 1-2)

ADDITIONAL COURSES (12 credits)[1]
Select 12 credits from ART 217(3), ART 220(3), ART 223(3), ART 230(3), ART 240(3), ART 250(3), ART 251(3), ART 260(3), ART 270(3), ART 271(3), ART 280(3), or ART 290(3) (Sem: 3-8)

SUPPORTING COURSES AND RELATED AREAS (24 credits)
(Include at least 15 credits[1] at the 400 or equivalent level.)

Select 12 credits from ceramics, drawing and painting, graphic design, metals, photography, printmaking, or sculpture (Sem: 3-8)
Select 12 credits in art history (6 of these credits may also be counted toward the General Education Arts requirement) (Sem: 1-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44..

ART, B.F.A.

College of Arts and Architecture
The Bachelor of Fine Arts degree requires thorough preparation and is intended to develop a level of competence that will enable persons who wish to pursue professional careers in art to prepare themselves for specialized graduate studies, specialized professional training, and/or immediate participation in creative work.

Students who are enrolled in the B.A. program in art and other students with an art portfolio may apply for entrance into the B.F.A. program no earlier than the second semester and no later than the fourth semester.

There will be a continuous review of portfolio and performance of students enrolled in the B.F.A. program throughout the entire program. Students who do not meet the standards or who do not want to continue in the B.F.A. program may return to the B.A. program in art or choose another program of study.

For the B.F.A. degree in Art, a minimum of 128 credits is required.

GENERAL EDUCATION: 45 credits
(6 of these credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 6 credits

REQUIREMENTS FOR THE MAJOR: 83 credits
(This includes 6 credits of General Education GA courses.)

PRESCRIBED COURSES (18 credits)[1]
ART 110S(3), ART 111(3), ART 120(3), ART 122W(3), ART H 111 GA(3), ART H 112 GA(3) (Sem: 1-2)

ADDITIONAL COURSES (15 credits)[1]
Select 15 credits at the beginning level from ART 217(3), ART 220(3), ART 223(3), ART 230(3), ART 240(3), ART 250(3), ART 251(3), ART 260(3), ART 270(3), ART 271(3), ART 280(3), or ART 290(3) (Sem: 3-8)

SUPPORTING COURSES AND RELATED AREAS (50 credits)
(Include at least 15 credits at the 400 or equivalent level)
Select 44 credits in Art at the 300 or 400 level, 24 of which must be in an area of concentration from the following: ceramics, drawing, graphic design, metals, painting, photography, printmaking, or sculpture[1] (Sem: 3-8)
Select 6 credits in art history (Sem: 3-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

ART EDUCATION

College of Arts and Architecture
This major offers two options: Art Education for Schools, and Art Education for Museums and Cultural Institutions. An integral part of each option for students is a basic art studio, art history, art criticism, and aesthetics preparation, a variety of observational and participatory experiences in art learning environments, and an extensive pre-practice internship. Upon completion of the option, employment prospects and/or acceptance for advanced graduate studies depends upon individual achievement and qualifications. (See also Teacher Education Programs.)

For the B.S. degree in Art Education with an option in Art Education for Museums and Cultural Institutions, a minimum of 124 credits is required; with an option in Art Education for Schools, a minimum of 135 credits is required.

GENERAL EDUCATION: 45 credits
(12-15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 90-105 credits
(This includes 12 credits of General Education courses in the Art Education for Museums and Cultural Institutions option, and 15 credits for the Art Education for Schools option: 6 credits of GA courses; 3 credits of GS courses; 3-6 credits of GH courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 36 credits

PRESCRIBED COURSES (33 credits)[1]
A ED 101S(3), ART H 111 GA(3) (Sem: 1-2)
A ED 201W(3), A ED 211GA(3), A ED 212(1), ART 122W(3), ART H 112GA(3) (Sem: 3-4)
A ED 225 GA;GI(3), A ED 322(3), A ED 401(3), A ED 490(2), PSY 002 GS(3) (Sem: 3-8)

ADDITIONAL COURSES (3 credits)[1]
PHIL 005GH(3) or PHIL 109 GH(3) (Sem: 3-8)

REQUIREMENTS FOR THE OPTION: 54-69 credits

ART EDUCATION FOR MUSEUMS AND CULTURAL INSTITUTIONS OPTION: 54-55 credits

PRESCRIBED COURSES (19-21 credits)[1]
A ED 440(3), A ED 488(1-3), A ED 495(15) (Sem: 5-8)

ADDITIONAL COURSES (9 credits)[1]
Select 6 credits from ART 110S(3), ART 111(3), ART 120(3) (Sem: 1-4)
Select 3 credits in ART H from department list or ANTH 380(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (24-27 credits)
Select 18 credits from one of the following emphases a, b, c, d, e, or f (Students may apply 6 credits of ROTC.)
a. Studio Emphasis: Select 3 credits from ART 110S(3), ART 111(3), ART 120(3); Select 15 credits in ART with at least 6 credits at the 300 or 400 level (Sem: 3-6)
b. Art History with at least 6 credits at the 300 or 400 level (Sem: 3-8)
c. Human Development and Family Studies with at least 6 credits at the 300 or 400 level (Sem: 3-8)
d. Women's Studies with at least 6 credits at the 300 or 400 level (Sem: 3-8)
e. American Studies with at least 6 credits at the 300 or 400 level (Sem: 3-8)
f. Individualized cluster of courses approved in advance by the Art Education Program, including at least 6 credits at the 300 or 400 level (Sem: 3-8)
Select 6-9 credits from non-art education courses (Sem: 3-8)

ART EDUCATION FOR SCHOOLS OPTION: 69 credits

PRESCRIBED COURSES (36 credits)[1]
ART 110S(3), ART 111(3), ART 120(3), EDPSY 014(3) (Sem: 1-4)
A ED 323(3), SPLED 400(3) (Sem: 3-6)
A ED 489(3) (Sem: 7-8)
C I 495D(7), C I 495E(8) (Sem: 9)

ADDITIONAL COURSES (15 credits)[1]
Select 3 literature credits in ENG (GH) or CMLIT (GH) (Sem: 1-4)
Select 12 credits from ART at the 200 level (Sem: 3-6)

SUPPORTING COURSES AND RELATED AREAS (18 credits)
Select 18 credits from one of the following emphases a, b, c, d, e, or f (Students may apply 6 credits of ROTC.)
a. Studio Emphasis with at least 6 credits at the 300 or 400 level (Sem: 3-8)
b. Art History with at least 6 credits at the 300 or 400 level (Sem: 3-8)
c. Human Development and Family Studies with at least 6 credits at the 300 or 400 level (Sem: 3-8)
d. Women's Studies with at least 6 credits at the 300 or 400 level (Sem: 3-8)
e. American Studies with at least 6 credits at the 300 or 400 level (Sem: 3-8)
f. Individualized cluster of courses approved in advance by the Art Education Program, including at least 6 credits at the 300 or 400 level (Sem: 3-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

ART HISTORY

College of Arts and Architecture
For the B.A. degree in Art History, a minimum of 124 credits is required.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 19 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 36 credits[1]

PRESCRIBED COURSES (15 credits)
ART H 111 GA(3), ART H 112 GA(3), ART H 201 GA(3), ART H 202 GA(3) (Sem: 1-4)
ART H 350W(3) (Sem: 5-8)

ADDITIONAL COURSES (21 credits)
(At least 6 credits must be taken at the 400 level, excluding ART H 496, ART H 297, ART H 397, and ART H 497 also may be used to fulfill the additional course requirements when the subject matter is appropriate.)
Select 3 credits from ART H 120 GA;GI(3), ART H 130 GA;GI(3), ART H 320 GA;GI(3), ART H 330 GA;GI(3), or ART H 340 GA;GI(3) (Sem: 3-8)
Select 3 credits from ART H 301 GA(3), ART H 311 GA(3), ART H 401(3-9), or ART H 411(3-9) (Sem: 3-8)
Select 3 credits from ART H 302 GA(3), ART H 312 GA(3), ART H 402(3), ART H 412(3), ART H 422(3-9), ART H 442(3), or ART H 452(3) (Sem: 3-8)
Select 3 credits from ART H 303 GA(3), ART H 304 GA(3), ART H 313 GA(3), ART H 314 GA(3), ART H 324 GA(3), ART H 404(3), ART H 414(3), ART H 423(3-9), ART H 424(3), ART H 454(3), ART H 456(3), ART H 458(3), or ART H 464(3) (Sem: 3-8)
Select 3 credits from ART H 305 GA(3), ART H 307 GA(3), ART H 325 GA(3), ART H 405(3-6), ART H 415(3), ART H 416(3), ART H 430(3), ART H 435(3-6), ART H 450(3), or ART H 470(3) (Sem: 3-8)
Select 6 credits of art history (excluding ART H 100 GA) (Sem: 3-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

ASTRONOMY AND ASTROPHYSICS

Eberly College of Science
Astronomy involves the study of the properties, physical nature and origins of the planets, stars, galaxies and universe as a whole. It involves development of instrumentation, observations of celestial objects with ground- and space-based telescopes, and interpretation of findings using the mathematical laws of physics such as gravity, electromagnetism and quantum mechanics. The undergraduate major provides a strong and broad foundation in mathematics, physical science and computation as well as a detailed understanding of modern astronomy. Many research opportunities are available to complement the formal classwork. Graduates proceed to advanced degrees in astronomy and other sciences, and into a wide variety of technical professions.

For the B.S. degree in Astronomy and Astrophysics, a minimum of 124 credits is required.

In order to be eligible for entrance to the Astronomy and Astrophysics major, a student must have: (1) Attained at least a 2.00 cumulative grade-point average and (2) Completed ASTRO 291 GN(3), CHEM 012 GN(3), MATH 140 GQ(4), MATH 141 GQ(4), PHYS 211 GN(4), and PHYS 212 GN(4)—and earned a grade of C or better in each of these courses.

GENERAL EDUCATION: 45 credits
(18 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)

WRITING ACROSS THE CURRICULUM: (Included in GENERAL EDUCATION course selection or REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 97 credits
(This includes 18 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GWS courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 63-64 credits

PRESCRIBED COURSES (48 credits)
ASTRO 291 GN(3)[1], ASTRO 292 GN(3)[1], ASTRO 293(1), ENGL 202C GWS(3), MATH 230(4), MATH 251(4), PHYS 237(3) (Sem: 3-4)
CHEM 012 GN(3)[1], CHEM 013 GN(3), CHEM 014 GN(1), MATH 140 GQ(4)[1], MATH 141 GQ(4)[1] , PHYS 211 GN(4)[1], PHYS 212 GN(4)[1], PHYS 213 GN(2)[1], PHYS 214 GN(2)[1] (Sem: 1-4)

ADDITIONAL COURSES (3-4 credits)
CMPSC 201C GQ(3), CMPSC 201F GQ(3) or CSE 103 GQ(4) (Sem: 1-4)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 12 credits[1] from 400-level ASTRO courses except 496 (Sem: 5-8)

REQUIREMENTS FOR THE OPTION: 33-34 credits

GRADUATE STUDY OPTION: 33-34 credits

PRESCRIBED COURSES (10 credits)
PHYS 400(3), PHYS 410(4), PHYS 419(3) (Sem: 5-8)

ADDITIONAL COURSES (9-10 credits)
Select 3 credits from MATH 405(3) or MATH 411(3) (Sem: 3-4)
Select 6-7 credits from PHYS 401(3), PHYS 402(4), PHYS 406(3), PHYS 411(3), PHYS 420(3), PHYS 457 (1-3), PHYS 457W (3), PHYS 461(3), and E E 490(3) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (13-15 credits)
Select 3 additional credits from advanced courses in computer science and engineering, mathematics, or statistics (Sem: 5-6)
Select 10-12 credits in consultation with adviser from department list (Sem: 3-8)

COMPUTER SCIENCE OPTION: 33-34 credits

PRESCRIBED COURSES (6 credits)
CSE 120(3) (Sem: 5-8)
CSE 451(3) (Sem: 7-8)

ADDITIONAL COURSES (9 credits)
Select 3 credits from STAT 318(3), STAT 319(3), STAT 401(3), or STAT 414(3) (Sem: 5-6)
Select 6 credits from CSE 260(3), CSE 271(3), CSE 331(3), or CSE 465(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (18-19 credits)
Select 6 additional credits from advanced courses in computer science and engineering, mathematics, or statistics (Sem: 5-8)
Select 12-13 credits in consultation with adviser from department list (Sem: 3-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

BEHAVIORAL SCIENCE, APPLIED

See Applied Behavioral Science

BIOBEHAVIORAL HEALTH

College of Health and Human Development

This major provides interdisciplinary training designed to integrate biological, behavioral, and social science approaches to the study of human health and illness. Emphasis is placed on the study of physical health. The goal of this major is to help students gain working familiarity with multiple perspectives, approaches, and

methods needed to address and solve problems of human health and illness. Students may select courses in the supporting courses category that will fulfill requirements for admission to graduate and professional programs. This major helps prepare graduates for entry-level jobs in a range of biomedical and health-related areas, including roles as research assistants, laboratory managers, biomedical product representatives, technical support positions in biomedical and health-related fields. This major also will provide excellent preparation for advanced study in natural and social science disciplines and related professional areas such as epidemiology, public health, environmental health and safety, and human services.

For the B.S. degree in Biobehavioral Health, a minimum of 120 credits is required.

GENERAL EDUCATION: 45 credits
(22 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 3 credits

REQUIREMENTS FOR THE MAJOR: 94 credits
(This includes 22 credits of General Education courses: 4 credits of GQ courses; 9 credits of GN courses; 6 credits of GS courses; 3 credits of GHA courses.)

PRESCRIBED COURSES (38 credits)
BIOL 110 GN(4), CHEM 012 GN(3)[1] (Sem: 1-2)
BB H 101 GHA(3)[1], BIOL 141 GN(3)[1], NUTR 251 GHA(3), PSY 002 GS(3)[1], STAT 200 GQ(4)[1] (Sem: 1-4)
BB H 310W(3)[1], BB H 311(3)[1], BB H 316(3)[1], BB H 411(3)[1], BB H 440(3)[1] (Sem: 5-8)

ADDITIONAL COURSES (45 credits)
BIOL 033 GN(3) or BIOL 222(3) (Sem: 1-2)
Select 12 credits from: CHEM 013 GN(3), CHEM 014 GN(1), CHEM 015 GN(1) (Sem: 1-2)
CHEM 034(3), CHEM 035(3), CHEM 036(2), CHEM 038(3), CHEM 039(3), MICRB 106 GN(3), MICRB 107 GN(1), PSY 203(3) (Sem: 3-4)
B M B 211(3), BIOL 055 GN(3), BIOL 129 GN(4), BIOL 142(1), BIOL 230W GN(4), BIOL 341 GN(3), BIOL 422W(3), BIOL 409(3), BIOL 479(3), PHYS 250 GN(4), PHYS 251 GN(4), PSY 402(3), PSY 404(3), PSY 408(3), PSY 412(3), PSY 456(3), PSY 485(3) (Sem: 5-8)
Select 15 credits from: BB H 302 GI(3)[1], BB H 315 GI(3)[1], BB H 368(3)[1], BB H 410(3)[1], BB H 416(3)[1], BB H 417(3), BB H 432(3)[1], BB H 446(3)[1], BB H 451(3)[1], BB H 452(3)[1], BB H 458(3)[1], BB H 469(3)[1], BB H 470(3)[1] (Sem: 5-8)
Select 9 credits from: H P A 057 GHA(3), H P A 101(3), H P A 310(3), HD FS 311(3), HD FS 315 GI3), HD FS 418(3); HD FS 428(3) or HD FS 429(3); HD FS 433(3) or HD FS 445(3); HD FS 468(3), NURS 401(3), NURS 452(3), NUTR 358(2), PSY 487(3) (Sem: 5-8)
Select 3 credits from: HD FS 129 GS(3), HD FS 229 GS(3), HD FS 239 GS(3), or HD FS 249 GS(3) (Sem: 5-8)
Select 3 credits from: BB H 301(3), PHIL 110 GH(3), PHIL 132 GH(3), PHIL 221 GH(3), PHIL 432(3), S T S 122 GH(3), S T S 123 GH(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (11 credits)
(Must include at least 6 credits at the 400 level)
Select 3 credits in health promotion from approved list, in consultation with adviser (Sem: 5-8)
Select 8 credits in University-wide offerings from approved list, in consultation with advisor (Students may apply 6 credits of ROTC.) (Sem: 5-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

BIOCHEMISTRY AND MOLECULAR BIOLOGY

Eberly College of Science

Students in this major apply basic principles of chemistry and physics to the study of living cells and their components to explain biology at molecular, genetic, and cellular levels. Students will develop a strong foundation in quantitative and analytical biological sciences, including molecular biology, biochemistry, enzymology, metabolism, cell biology, and molecular genetics. The curriculum is designed to prepare students for advanced study leading to careers in research, medicine, and education, or to secure employment in biotechnology and health-related industries, including government, academic, and private laboratories.

In order to be eligible for entrance to the Biochemistry and Molecular Biology major, a student must have: 1) attained at least a 2.00 cumulative grade-point average, and 2) completed CHEM 012 GN(3), CHEM 013 GN(3), CHEM 014 GN(1), and MATH 140 GQ(4); and earned a grade of C or better in each of these courses.

For the B.S. degree in Biochemistry and Molecular Biology, a minimum of 125 credits is required.

GENERAL EDUCATION: 45 credits
(15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 95 credits[86]
(This includes 15 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses.)

PRESCRIBED COURSES (74 credits)
CHEM 012 GN(3)[1], CHEM 013 GN(3)[1], CHEM 014 GN(1)[1], CHEM 015 GN(1), MATH 140 GQ(4)[1], MATH 141 GQ(4), PSU 016(1), (Sem: 1-2)
PHYS 211 GN(4), PHYS 212 GN(4), PHYS 213 GN(2), PHYS 214 GN(2) (Sem: 1-4)
B M B 251(3)[85], B M B 252(3)[85], B M B 342(3), BIOL 222(3), CHEM 036(2), CHEM 038(3), CHEM 039(3), MICRB 201(3)[85], MICRB 202(2) (Sem: 3-4)
B M B 400(3), B M B 401(2), B M B 402(3), B M B 443W(3) (Sem: 5-6)
B M B 445W(2), B M B 446(1), CHEM 451(3), CHEM 452(3) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (21 credits)
Select 10 credits from department list A (Sem: 5-8)
Select 2-3 credits in the mathematical sciences from department list B (Sem: 5-8)
Select 8-9 credits from department list C (Sem: 7-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
[85] To graduate, a grade of C or better is required in two of the following courses: MICRB 201, B M B/MICRB 251, B M B/MICRB 252.
[86] To graduate, a grade of C or better is required in 9 credits of any B M B or MICRB 400-level course except B M B 443W, B M B 444, B M B 445W, B M B 446, B M B 495, B M B 496, MICRB 421W, MICRB 422, MICRB 447, MICRB 495, MICRB 496.

BIOENGINEERING

College of Engineering

Bioengineering is the application of engineering principles to biology and medicine. Graduates of the major assume positions in the healthcare industry, pursue further studies of the biomedical and engineering sciences in graduate school or enter medical school. Industrial employment in design, production, product research and development, technical service, and sales are available at the entry level for B. S. graduates. The unique combination of life science and engineering prepare graduates to assume a leadership role in the development of medical devices and technology. The Bioengineering B.S. requires the student to select an option, in which engineering science courses are focused.

For the B.S. degree in Bioengineering, a minimum of 131 credits is required.

Students in residence at the Commonwealth campuses may satisfy the course requirements for semesters 1-3. They should then go to University Park to begin studies in their major beginning with semester 4.

GENERAL EDUCATION: 45 credits
(21 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of the Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 107-109 credits
(This includes 21 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses; 3 credits of GWS courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 82 credits

PRESCRIBED COURSES (72 credits)
BIOL 141 GN(3)[1], BIOL 142(1), ED&G 100(3) (Sem: 1-2)
CHEM 012 GN(3), CHEM 013 GN(3), CHEM 014 GN(1), CHEM 015 GN(1) (Sem: 1-2)
MATH 140 GQ(4), MATH 141 GQ(4), PHYS 211 GN(4) (Sem: 1-2)
BIOE 201(3)[1], BIOE 301(3)[1], BIOE 302(1) (Sem: 3-4)
CMPSC 201C GQ(3), E MCH 210 (5) (Sem: 3-4)
MATH 220(2), MATH 231(2), MATH 251(4)[1], PHYS 212 GN(4) (Sem: 3-4)
BIOE 303(3)[1], BIOE 401(3)[1], BIOE 402(3)[1], BIOE 403(1) (Sem: 5-6)
ENGL 202C GWS(3) (Sem: 5-6)
BIOE 440(1), BIOE 450W(3), BIOE 490(1) (Sem: 7-8)

ADDITIONAL COURSES (4 credits)
Select 1 credit of First-Year Seminar (Sem: 1-2)
ECON 002 GS(3), ECON 004 GS(3), or ECON 014(3) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits of BIOE courses (Sem: 7-8)

REQUIREMENTS FOR THE OPTION: 25-27 credits

CHEMICAL ENGINEERING OPTION: 25 credits

PRESCRIBED COURSES (25 credits)
CHEM 038(3) (Sem: 3-4)
CHEM 036(2), CHEM 039(3), BIOE 313(3), BIOE 413(3), B M B 401(2), M E 030(3) (Sem: 5-6)
BIOE 423(3), CHEM 451(3) (Sem: 7-8)

ELECTRICAL ENGINEERING OPTION: 27 credits

PRESCRIBED COURSES (15 credits)
E E 210(4) (Sem: 3-4)
CSE 271(3), CSE 275(1), E E 310(4), M E 030(3) (Sem: 5-6)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 3 credits of electrical engineering from department list (Sem: 5-6)
Select 9 credits of electrical engineering from department list (Sem: 7-8)

MATERIALS SCIENCE OPTION: 26 credits

PRESCRIBED COURSES (26 credits)
PHYS 214 GN(2) (Sem: 3-4)
MATSE 201(3), MATSE 401(3), MATSE 402(3), MATSE 443(3), CHEM 038(3) (Sem: 5-6)
MATSE 403(3), MATSE 404(3), MATSE 430(3) (Sem: 7-8)

MECHANICAL ENGINEERING OPTION: 27 credits

PRESCRIBED COURSES (15 credits)
E MCH 012(3) (Sem: 3-4)
M E 030(3), M E 050(3), I E 327(3) (Sem: 5-6)
M E 440(3) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 3 credits from department list (Sem: 5-6)
Select 9 credits from department list (Sem: 7-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

BIOLOGICAL ANTHROPOLOGY

College of the Liberal Arts
(The Bachelor of Science degree in Biological Anthropology is offered by the Biological Anthropology Program in the Department of Anthropology.)
The Bachelor of Science degree provides the opportunity to develop a strong foundation in research methods, quantification, and laboratory science. It prepares students with the skills and competencies needed to pursue graduate study or careers in professions associated with biological anthropology. Students contemplating futures

in biomedical or forensic sciences should consult with Penn State's Premedicine Office or the specific forensic science graduate program to make certain that additional courses in organic chemistry and physics that are required for admission are completed.

For the B.S. degree in Biological Anthropology, a minimum of 125 credits is required.

GENERAL EDUCATION: 45 credits
(18 of these credits are included in REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 12-15 credits

REQUIREMENTS FOR THE MAJOR: 83-86 credits [1]
(This includes 18 credits of General Education courses: 9 credits GN courses; 6 credits GQ courses; 3 credits GH courses.)

PRESCRIBED COURSES (51 credits)
ANTH 002 GS(3), ANTH 021 GN(3), ANTH 045 GS;GI(3), BIOL 110 GN(4), BIOL 129 GN(4), BIOL 240W GN(4), B M B 251(3), CHEM 012 GN(3), CHEM 013 GN(3), CHEM 014 GN(1), CHEM 015 GN(1), MATH 140 GQ(4), MATH 141 GQ(4), PHYS 250 GN(4), STAT 200 GQ(4) STAT 460(3) (Sem: 1-6)

ADDITIONAL COURSES (32-35 credits)
Select 3-4 credits from ANTH 460(3) or ANTH 460H(4) (Sem: 3-8)
Select 15 additional credits in consultation with adviser from the following ranges: ANTH 401-419(3) or ANTH 460-473(3) (Sem: 3-8)
Select 3-4 credits from the following: CHEM 034(3), BIOL 230W GN(4), or BIOL 141 GN(3) (Sem: 3-8)
Select 2-3 credits from the following: B M B 401(2), BIOL 411(3), or KINES 202(4) (Sem: 3-8)
Select 3 credits from the following: PHIL 011 GH(3), PHIL 116 GH(3), PHIL 132 GH(3), PHIL 221 GH(3) (Sem: 3-8)
Select 6 additional credits in consultation with adviser either in ANTH electives other than ANTH 001, or carry out a senior project under ANTH 496(6), as advised (Sem: 3-8)
NOTE: Internships will be counted as elective credits.
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

BIOLOGY

Penn State Erie, The Behrend College

The curriculum in Biology is designed to provide students with a strong background in the biological sciences. It provides preparation for students who intend to secure advanced degrees through graduate study; students who intend to prepare for careers in medicine or health-related fields, and students preparing for careers with companies or agencies requiring employees with biological backgrounds. The curriculum has six options allowing students to choose an area of specialization which will best meet their career goals. In addition to selecting an option, students are strongly encouraged to participate in faculty supervised research. The options are: General Biology—various areas of modern biology; Ecology—population and community biology of plants and animals; Genetics and Developmental Biology—genetics and developmental biology of plants and animals; Molecular Biology and Biochemistry—molecular and cellular mechanisms of biology; Medical Technology—prepares students for careers in clinical laboratories; and Pre-Professional—allows exceptional students, who gain early admission to a professional school, to fulfill option requirements with a set number of academic credits taken during the first professional year.

For the B.S. degree in Biology, a minimum of 124 credits is required. Each student must earn at least a grade of C in each 200-, 300-, and 400-level course in the major field.

GENERAL EDUCATION: 45 credits
(18 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 1 credit

REQUIREMENTS FOR THE MAJOR: 96 credits
(This includes 18 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GWS courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 41 credits

PRESCRIBED COURSES (41 credits)
CHEM 012 GN(3), CHEM 013 GN(3), CHEM 014 GN(l), CHEM 015 GN(l) (Sem: 1-2)
BIOL 110 GN(4), BIOL 220W GN(4)[1], BIOL 230W GN(4)[1], BIOL 240W GN(4)[1], MATH 140 GQ(4), MATH 141 GQ(4) (Sem: 1-4)
ENGL 202C GWS(3), STAT 250 GQ(3) (Sem: 3-6)
BIOBD 322(3) (Sem: 5-6)

REQUIREMENTS FOR THE OPTION: 55-57 credits

ECOLOGY OPTION: 55 credits
Students can select courses in theoretical or aquatic ecology, field biology and animal behavior to build a strength in ecological methodology. The option prepares students for graduate study in ecology or careers in zoo science, environmental consulting, environmental management, environmental education or positions with regulatory agencies.

PRESCRIBED COURSES (9 credits)
BIOBD 401W(3), BIOBD 429(2), BIOBD 460(3) (Sem: 5-8)
BIOBD 494A(1) (Sem: 7-8)

ADDITIONAL COURSES (20-24 credits)
Select 6-8 credits from one of the following sequences:
a. CHEM 034(3), CHEM 035(3) (Sem: 3-4)
b. CHEM 036(2), CHEM 038(3), CHEM 039(3) (Sem: 3-4)
Select 8-10 credits from one of the following sequences:
a. PHYS 250 GN(4), PHYS 251 GN(4) (Sem: 5-8)
b. PHYS 211 GN(4), PHYS 212 GN(4); PHYS 213 GN(2) or PHYS 214 GN(2) (Sem: 5-8)
Select 6 credits from the following:
BIOBD 419(3), BIOBD 426(3), MTHBD 446(3) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (22-26 credits)
Select 6 credits of 400-level BIOBD courses excluding BIOBD 429, BIOBD 494A, BIOBD 494B, BIOBD 495, and BIOBD 496 (Sem: 5-8)
Select 16-20 credits from school approved list (Sem: 1-8)

GENERAL BIOLOGY OPTION: 55 credits
Students can select courses from a variety of areas of contemporary biology. The option provides the flexibility to enable students to tailor their program for graduate study in many fields of biology or careers requiring broad backgrounds and diverse skills in the biological sciences.

PRESCRIBED COURSES (6 credits)
BIOBD 401W(3), BIOBD 429(2), BIOBD 494A(l) (Sem: 5-8)

ADDITIONAL COURSES (14-18 credits)
Select 6-8 credits from one the following sequences:
a. CHEM 034(3), CHEM 035(3) (Sem: 3-4)
b. CHEM 036(2), CHEM 038(3), CHEM 039(3) (Sem: 3-4)
Select 8-10 credits from one of the following sequences:
a. PHYS 250 GN(4), PHYS 251 GN(4) (Sem: 5-8)
b. PHYS 211 GN(4), PHYS 212 GN(4); PHYS 213 GN(2) or PHYS 214 GN(2) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (31-35 credits)
Select 15 credits of 400-level BIOBD courses excluding BIOBD 429, BIOBD 494A, BIOBD 494B, BIOBD 495, and BIOBD 496 (Sem: 5-8)
Select 16-20 credits from school approved list (Sem: 1-8)

GENETICS AND DEVELOPMENTAL BIOLOGY OPTION: 55 credits
Students can select courses to develop strengths in various areas of transmission, medical, population or molecular genetics and/or study the developmental process at the organismal, histological or molecular levels. The option prepares students for admission to professional programs in the health sciences, graduate programs in genetic counseling, plant or animal breeding, developmental biology, or careers in research or biotechnology.

PRESCRIBED COURSES (16 credits)
CHEM 036(2), CHEM 038(3), CHEM 039(3) (Sem: 3-4)
MICRB 201(3)[1], MICRB 202(2)[1] (Sem 3-6)
BIOBD 429(2), BIOBD 494A(l) (Sem: 5-8)

ADDITIONAL COURSES (17-19 credits)
Select 9 credits from the following:
BIOBD 425(3), BIOBD 426(3), BIOBD 445(3), BIOBD 449(3), BIOBD 460(3) (Sem: 5-8)
Select 8-10 credits form one of the following sequences:
a. PHYS 250 GN(4), PHYS 251 GN(4) (Sem: 5-8)
b. PHYS 211 GN(4), PHYS 212 GN(4); PHYS 213 GN(2) or PHYS 214 GN(2) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (20-22 credits)
Select 6 credits of 400-level BIOBD courses excluding BIOBD 429, BIOBD 494A, BIOBD 494B, BIOBD 495, and BIOBD 496 (Sem: 5-8)
Select 14-16 credits from school approved list (Sem: 1-8)

MEDICAL TECHNOLOGY OPTION: 55-57 credits
Students spend approximately twelve months at an affiliated hospital[12] during their senior year to complete the clinical phase of their baccalaureate studies. A fixed number of spaces are available on a competitive basis of grade-point average and hospital approval. The Bachelor of Science degree in Biology is awarded upon successful completion of the clinical study. The graduate is also eligible to take the national examination for certification and registry as a medical technologist.

PRESCRIBED COURSES (44 credits)
MICRB 201(3)[1], MICRB 202(2)[1] (Sem: 3-4)
PHYS 250 GN(4), PHYS 251 GN(4) (Sem: 5-6)
BIOBD 430A(6), BIOBD 430B(3), BIOBD 430C(7), BIOBD 430D(4), BIOBD 430E(4), BIOBD 430F(4), BIOBD 430G(l), BIOBD 430I(1), BIOBD 430K(l) (Sem: 7-8)

ADDITIONAL COURSES (8-10 credits)
Select 6-8 credits from one the following sequences:
a. CHEM 034(3), CHEM 035(3), CHMBD 221(4) (Sem: 3-4)
b. CHEM 036(2), CHEM 038(3), CHEM 039(3) (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (3 credits)
Select 3 credits of 400-level BIOBD from:
BIOBD 401W(3), BIOBD 424(3), BIOBD 425(3), BIOBD 452(3), BIOBD 460(3), or BIOBD 469(3) (Sem: 5-6)

MOLECULAR BIOLOGY AND BIOCHEMISTRY: 55 credits
Students can select courses to develop strengths in the study of biology at the cellular and molecular levels, including basic metabolism and its regulations, DNA recombinant technology, bioinformatics and genomics. The option prepares students for admission to professional programs in the health sciences, graduate study, or careers in biotechnology or research.

PRESCRIBED COURSES (26 credits)
CHEM 036(2), CHEM 038(3), CHEM 039(3), MICRB 201(3)[1], MICRB 202(2)[1] (Sem 3-6)
BIOBD 429(2), BIOBD 452(3), BIOBD 453(1), BIOBD 460(3), BIOBD 494A(l), CHMBD 451(3) (Sem: 5-8)

ADDITIONAL COURSES (8-10 credits)
Select 8-10 credits from one of the following sequences:
a. PHYS 250 GN(4), PHYS 251 GN(4) (Sem: 5-8)
b. PHYS 211 GN(4), PHYS 212 GN(4); PHYS 213 GN(2) or PHYS 214 GN(2) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (20-22 credits)
Select 9 credits of 400-level BIOBD courses excluding BIOBD 429, BIOBD 494A, BIOBD 494B, BIOBD 495, and BIOBD 496 (Sem: 5-8)
Select 10-12 credits from school approved list (Sem: 1-8)

PRE-PROFESSIONAL OPTION: 55 credits
Exceptional students who are admitted into a "3+4" accelerated or early acceptance program at an approved or affiliated professional school are granted 21 credits toward the Bachelor of Science degree following the successful completion of the first professional academic year.

PRESCRIBED COURSES (21 credits)
MICRB 201(3)[1], MICRB 202(2)[1] (Sem: 1-2)

CHEM 036(2), CHEM 038(3), CHEM 039(3) (Sem: 3-4)
BIOBD 420(4), BIOBD 452(3), BIOBD 453(1) (Sem: 5-6)

ADDITIONAL COURSES (8-10 credits)
Select 8-10 credits from one of the following sequences:
a. PHYS 250 GN(4), PHYS 251 GN(4) (Sem: 5-8)
b. PHYS 211 GN(4), PHYS 212 GN(4); PHYS 213 GN(2) or PHYS 214 GN(2) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (24-26 credits)
Select 3-5 credits from school approved list (Sem: 1-8)
Select 21 credits of professional school academic courses (Sem: 7-8)
[1]A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
[12]Current affiliation is with St. Vincent Health Center, School of Medical Technology, Erie, Pa.

BIOLOGY

Altoona College; Eberly College of Science

The curriculum in Biology is planned for preparation for professions requiring competence in biological science or for gaining an understanding of the world of living things. The professional group includes students who intend to secure advanced degrees through graduate study, students who are interested in work with various governmental agencies or industries having biological responsibilities, and students who want to prepare for careers in medicine or other health-related professions. Students whose interests are not professional select the curriculum because its broad approach can result in an educated view of the structure and function of living things. Achievement of these goals, including a special interest in a particular area of biology, can be met by selecting one of five options offered by the Department of Biology that will lead to the B.S. degree in Biology. The options and their key areas are (1) Plant Biology—morphology, systematics, and physiology of plants and fungi; (2) Ecology—behavior, and population and community biology of plants and animals; (3) General Biology—all aspects of modern biology; (4) Genetics and Developmental Biology—genetics, genetic engineering, and plant and animal development; (5) Neuroscience-development, biochemistry, physiology and aging of the central and peripheral nervous system; (6) Vertebrate Physiology-pre-medicine, pre-dentistry, pharmacology, and animal physiology.

In order to be eligible for entrance to the Biology major, a student must have: (1) Attained at least a 2.00 cumulative grade point average. (2) Completed BIOL 110 GN(4), CHEM 012 GN(3), MATH 140 GQ(4); and earned a grade of C or better in each of these courses. (3) Completed at least one of the following courses, BIOL 220W GN(4), BIOL 230W GN(4), or BIOL 240W GN(4), with a grade of C or better.

For the B.S. degree in Biology, a minimum of 124 credits is required.

GENERAL EDUCATION: 45 credits
(15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 94 credits
(This includes 15 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses.)

COMMON REQUIREMENTS FOR MAJOR (ALL OPTIONS): 40-44 credits

PRESCRIBED COURSES (32 credits)
CHEM 012 GN(3)[1], CHEM 013 GN(3)[1], CHEM 014 GN(1), CHEM 015 GN(1), MATH 140 GQ(4)[1], MATH 141 GQ(4) (Sem: 1-2)
BIOL 110 GN(4)[1], BIOL 220W GN(4)[1], BIOL 230W GN(4)[1], BIOL 240W GN(4)[1] (Sem: 1-4)

ADDITIONAL COURSES (8-12 credits)
PHYS 250 GN(4), PHYS 251 GN(4); or PHYS 211 GN(4), PHYS 212 GN(4), PHYS 213 GN(2), PHYS 214 GN(2) (Sem: 5-6)

REQUIREMENTS FOR THE OPTION: 50-54 credits

ECOLOGY OPTION: 50-54 credits

PRESCRIBED COURSES (11 credits)
BIOL 427(3), BIOL 446(3) (Sem: 5-6)
BIOL 450W(5) (Sem: 7-8)

ADDITIONAL COURSES (21-26 credits)
CHEM 034(3), CHEM 035(3); or CHEM 036(2), CHEM 038(3), CHEM 039(3) (Sem: 3-4)
STAT 200(4) or STAT 240(3) or STAT 250(3) (Sem: 3-4)
Select 6-7 credits from BIOL 406(3), BIOL 412(3), BIOL 414(3), BIOL 415(3), BIOL 417(4), BIOL 428(3), BIOL 448(3), BIOL 464(3), BIOL 499A(3), HORT 440W(3), PPATH 416(3) (Sem: 5-6)
BIOL 435(3) or BIOL 482(4) (This course is offered at Wallops Island Marine Station in May.) (Sem: 5-8)
STAT 462(3) or STAT 464(3) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (13-22 credits)
Select 13-22 credits from department list (Sem: 1-8)

GENERAL BIOLOGY OPTION: 50-54 credits

PRESCRIBED COURSES (3 credits)
BIOL 427(3) (Sem: 5-6)

ADDITIONAL COURSES (21-24 credits)
CHEM 034(3), CHEM 035(3); or CHEM 036(2), CHEM 038(3), CHEM 039(3) (Sem: 3-4)
STAT 200 GQ(4), STAT 240(3), or STAT 250 GQ(3) (Sem: 3-4)

Select 12 credits of 400-level biology courses, with at least 3 credits from each of the following groups (each course may be used to satisfy a requirement in only one group): (Sem: 5-8)

Group I—BIOL 401(3), BIOL 403(3), BIOL 407(3), BIOL 410(2), BIOL 413(3), BIOL 414(3), BIOL 424(3), BIOL 425(3), BIOL 441(3), BIOL 446(3), BIOL 448(3), BIOL 459(3), BIOL 499A(3), HORT 407(3), HORT 440W(3), PPATH 416(2-4)

Group II—AN SC 442(3), BIOL 401(3), BIOL 403(3), BIOL 404(3), BIOL 405(3), BIOL 410(2), BIOL 411(3), BIOL 412(3), BIOL 413(3), BIOL 416(3), BIOL 422W(3), BIOL 428(3), BIOL 430(3), BIOL 432(3), BIOL 448(3), BIOL 460(3), BIOL 469(3), BIOL 499A(3), B M B 400(3), B M B 450(2), HORT 407(3)

Group III—BIOL 406(3), BIOL 412(3), BIOL 414(3), BIOL 415(3), BIOL 417(4), BIOL 428(3), BIOL 435(3), BIOL 446(3), BIOL 448(3), BIOL 450W(5), BIOL 464(3), BIOL 482(4), BIOL 499A(3), HORT 440W(3), PPATH 416(2-4)

Group IV—BIOL 404(3), BIOL 406(3), BIOL 409(3), BIOL 411(3), BIOL 412(3), BIOL 413(3), BIOL 416(3), BIOL 421(4), BIOL 430(3), BIOL 432(3), BIOL 437(4), BIOL 440(4), BIOL 446(3), BIOL 460(3), BIOL 469(3), BIOL 470(3), BIOL 471(3), BIOL 472(3), BIOL 473(2), BIOL 479(3), BIOL 499A(3), B M B 400(3)

SUPPORTING COURSES AND RELATED AREAS (23-30 credits)
Select 23-30 credits from department list (Sem: 1-8)

GENETICS AND DEVELOPMENTAL BIOLOGY OPTION: 50-54 credits

PRESCRIBED COURSES (19 credits)
CHEM 036(2), CHEM 038(3), CHEM 039(3) (Sem: 3-4)
BIOL 222(3), BIOL 430(3) (Sem: 5-6)
B M B 401(2), B M B 402(3) (Sem: 5-8)

ADDITIONAL COURSES (17-21 credits)
Select 2-5 credits from MATH 220 GQ(2), MATH 231(2), MICRB 201(3), MICRB 202(2) (Sem: 3-6)
STAT 200 GQ(4),STAT 240(3), STAT 250 GQ(3), or STAT 319(3) (Sem: 5-6)
Select 12 credits from AN SC 442(3), B M B 400(3), B M B 450(2), BIOL 401(3), BIOL 403(3), BIOL 404(3), BIOL 405(3), BIOL 410(2), BIOL 411(3), BIOL 412(3), BIOL 413(3), BIOL 416(3), BIOL 422W(3), BIOL 427(3), BIOL 428(3), BIOL 430(3), BIOL 432(3), BIOL 440(4), BIOL 448(3), BIOL 460(3), BIOL 469(3), BIOL 499A(3), HORT 407(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (10-18 credits)
Select 10-18 credits from department list (Sem: 1-8)

NEUROSCIENCE OPTION: (50-54 credits)

PRESCRIBED COURSES (19 credits)
BMB 401(2), BMB 402(3) (Sem: 5-8)
BIOL 469(3), BIOL 470(3) (Sem: 5-8)
CHEM 036(2), CHEM 038(3), CHEM 039(3) (Sem: 3-4)

ADDITIONAL COURSES (15-19 credits)
STAT 200 GQ(4), STAT 240(3), or STAT 250 GQ(3) (Sem: 3-4)
Select 12-15 credits from the following courses: AN SC 455(3), BIOL 401(3), BIOL 403(3), BIOL 404(3), BIOL 409(3), BIOL 411(3), BIOL 412(3), BIOL 413(3), BIOL 421(4), BIOL 430(3), BIOL 437(4), BIOL 460(3), BIOL 471(3), BIOL 472(3), BIOL 473(3), BIOL 479(3), BIOL 497(1-9), BMB 400(3) (may select up to 6 credits from department list) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (12-20 credits)
Select 12-20 credits from department list (Sem: 1-8)

PLANT BIOLOGY OPTION: 50-54 credits

PRESCRIBED COURSES (22 credits)
CHEM 036(2), CHEM 038(3), CHEM 039(3) (Sem: 3-4)
B M B 401(2), B M B 402(3) (Sem: 5-6)
BIOL 407(3), BIOL 414(3), BIOL 441(3) (Sem: 5-8)

ADDITIONAL COURSES (15-16 credits)
STAT 200 GQ(4), STAT 240(3), STAT 250 GQ(3), or an advanced statistics course(3) (Sem: 3-4)
Select 12 credits from BIOL 410(2), BIOL 413(3), BIOL 427(3), BIOL 446(3), BIOL 448(3), BIOL 459(3) or HORT 407(3), HORT 440W(3), PPATH 416(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (12-17 credits)
Select 12-17 credits from department list (Sem: 1-8)

VERTEBRATE PHYSIOLOGY OPTION: 50-54 credits

PRESCRIBED COURSES (18 credits)
CHEM 036(2), CHEM 038(3), CHEM 039(3) (Sem: 3-4)
B M B 401(2), B M B 402(3), BIOL 472(3), BIOL 473(2) (Sem: 5-8)

ADDITIONAL COURSES (15-16 credits)
STAT 200 GQ(4), STAT 240(3), or STAT 250 GQ(3) (Sem: 5-8)
Select 12 credits from B M B 400(3), BIOL 401(3), BIOL 403(3), BIOL 404(3), BIOL 406(3), BIOL 409(3), BIOL 411(3), BIOL 412(3), BIOL 413(3), BIOL 416(3), BIOL 421(4), BIOL 430(3), BIOL 432(3), BIOL 437(4), BIOL 440(4), BIOL 446(3), BIOL 460(3), BIOL 469(3), BIOL 470(3), BIOL 471(3), BIOL 479(3), BIOL 499A(3) (may select up to 6 credits from department list) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (16-21 credits)
Select 16-21 credits from department list (Sem: 1-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

BIOTECHNOLOGY

Eberly College of Science

Biotechnology may be broadly defined as the application of principles of molecular and cell science in the production of biologically important or industrially useful products. Therefore, students in the Biotechnology major will (1) acquire a strong foundation in the life and chemical sciences, (2) learn how fundamental science is applied to problems through biotechnology, (3) develop basic laboratory skills, perform standard techniques, work with state-of-the-art instrumentation, describe and evaluate analytical methodology used in biotechnology, and (4) become familiar with societal concerns and governmental regulations regarding the biotechnology industry. One very important strength of this major is the extensive laboratory experience each student receives. In the General option, students are very strongly encouraged to consider Cooperative Education with industry as an integral part of their curriculum. In addition to the General option in Biotechnology, the major also offers the Clinical Laboratory Science option.

In order to be eligible for entrance to the Biotechnology major, a student must have: (1) attained at least a 2.00 cumulative grade-point average, and (2) completed CHEM 012 GN(3), CHEM 013 GN(3), CHEM 014 GN(1), and MATH 140 GQ(4) and earned a grade of C or better in each of these courses.

For the B.S. degree in Biotechnology, a minimum of 125 credits is required.

GENERAL EDUCATION: 45 credits
(15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 95 credits[87]
(This includes 15 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses.)

COMMON REQUIREMENTS FOR MAJOR (ALL OPTIONS): 42 credits

PRESCRIBED COURSES (42 credits)
CHEM 012 GN(3)[1], CHEM 013 GN(3)[1], CHEM 014 GN(1)[1], CHEM 015 GN(1), MATH 140 GQ(4)[1], MATH 141 GQ(4), PSU 016(1) (Sem: 1-2)
PHYS 250 GN(4), PHYS 251 GN(4) (Sem: 1-4)
B M B 251(3)[85], B M B 252(3)[85], BIOL 222(3), MICRB 201(3)[85], MICRB 202(2) (Sem: 3-4)
MICRB 421W(3) (Sem: 5-6)

REQUIREMENTS FOR THE OPTION: 53 credits

GENERAL BIOTECHNOLOGY OPTION: 53 credits

PRESCRIBED COURSES (25 credits)
B M B 211(3), B M B 221(2), B M B 342(3), MICRB 410(3) (Sem: 5-6)
BIOTC 416(2), BIOTC 459(3), BIOTC 479(3), BIOTC 489(3), STAT 250 GQ(3) (Sem: 5-8)

ADDITIONAL COURSES (6-8 credits)
CHEM 034(3), CHEM 035(3); or CHEM 036(2), CHEM 038(3), CHEM 039(3) (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (20-22 credits)
Select 14-16 credits from department list (Sem: 3-8)
Select 6 credits from any 400-level B M B/MICRB lecture course, BIOL 422W(3) or FD SC 408(2) (Sem: 5-8)

CLINICAL LABORATORY SCIENCE OPTION: 53 credits
This option provides both the academic and clinical preparation for students interested in a career as a clinical laboratory scientist. Positions are found in hospital, physician-office, reference, industrial, and research laboratories. To complete baccalaureate degree requirements, students enter a twelve-month clincial practicum (MICRB 405A-F) at an affiliate hospital for the senior year. (Current affiliation is with Pennsylvania Hospital, Philadelphia.) Students are recommended for a fixed number of hospital positions on a competitive basis. Cumulative grade-point average and hospital school admission requirements serve as criteria for recommendation.

PRESCRIBED COURSES (44 credits)
B M B 211(3), B M B 212(1), B M B 221(2), MICRB 410(3), MICRB 412(3), MICRB 422(2) (Sem: 5-6)
MICRB 405A(8), MICRB 405B(1), MICRB 405C(6), MICRB 405D(5), MICRB 405E(7), MICRB 405F(3) (Sem: 7-8)

ADDITIONAL COURSES (6-8 credits)
CHEM 034(3), CHEM 035(3); or CHEM 036(2), CHEM 038(3), CHEM 039(3) (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (1-3 credits)
Select 1-3 credits from department list (Sem: 3-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
[85] To graduate, a grade of C or better is required in two of the following courses: MICRB 201, B M B/MICRB 251, B M B/MICRB 252.
[87] To graduate, a grade of C or better is required in 9 credits of any BIOTC, B M B, or MICRB 400-level course except B M B 443W, B M B 444, B M B 445W, B M B 446, B M B 495, B M B 496, MICRB 421W, MICRB 422, MICRB 447, MICRB 495, MICRB 496.

BUSINESS

Abington College; Altoona College; Berks-Lehigh Valley College; Commonwealth College

The Bachelor of Science in Business (BSB) is an upper-division, professionally oriented business degree for individuals who are seeking general preparation in business. The degree combines the theoretical underpinnings of core business disciplines, notably management, marketing, finance, and logistics, with applied study in a practical setting, especially the small-business climates across most of the Commonwealth. Through the choice of an 18-credit option, students develop a specialty related to a key business sector. Students also develop written and oral communication skills throughout the program, acquire contemporary computer skills, and engage in active and collaborative learning. The degree allows students throughout the Commonwealth to become familiar with the unique business environments of their local communities, a design that sets the degree apart from other business degrees offered both within the University and throughout the Commonwealth.

The associate degree in business administration at Penn State articulates with the degree. Advanced-standing students from other accredited colleges or universities will be admitted only with specified grade-point averages established annually in accordance with University policy.

ENTREPRENEURSHIP OPTION (offered only at the Altoona College): Preparation for a variety of entrepreneurial careers from starting a new business venture to working as an intrapreneur within a larger organization.

FINANCIAL SERVICES OPTION: Preparation for positions in community financial organizations such as banks, real estate firms, insurance brokers, investment firms, and credit companies.

HEALTH SERVICES OPTION: Development of a background in the financial and administrative aspects of health care enterprises such as hospitals, managed-care organizations, clinical practices, and physicians' offices.

INDIVIDUALIZED BUSINESS OPTION: The selection of 18 credits of study based on an individualized plan of study submitted by the student and approved by an adviser. The option allows the tailoring of a program of study to suit specific student needs.

MARKETING AND MANAGEMENT OPTION: An emphasis on the skills and knowledge necessary for the business professional to function in community and regional centers of commerce.

For the B.S. degree in Business, a minimum of 122 credits is required, 15 of which must be at the 400 level.

GENERAL EDUCATION: 45 credits
(12 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 5-16 credits

REQUIREMENTS FOR THE MAJOR: 73-84 credits
(This includes 12 credits of General Education courses: 6 credits of GQ courses; 6 credits of GS courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 55-66 credits

PRESCRIBED COURSES (35-40 credits)
ECON 002 GS(3) (Sem: 1-2)
ACCTG 211(4), B A 243(4)[64], ECON 004 GS(3), M I S 204(2) (Sem: 3-4)
B A 321(1-3)[1], B A 322(1-3)[1], B A 420(1)[1], B LOG 301(3)[1], FIN 301(3)[1][64], MGMT 301(3)[1][64], MKTG 301(3)[1][64] (Sem: 5-6)
B A 421(1-2)[1], B A 422W(3)[1] (Sem: 7-8)

ADDITIONAL COURSES (20-26 credits)
MATH 021 GQ(3) and MATH 022 GQ(3)[73]; or MATH 110 GQ(4) or MATH 140 GQ(4)[48] (Sem: 1-4)
Select 3-4 credits of CMPSC 203 GQ(4) or M I S 103(3)[48] [73] (Sem: 1-4)
MS&IS 200(4) or STAT 200 GQ(4) (Sem: 1-4)
B A 323(3)[1] or I B 303(3)[1] (Sem: 5-8)
Select 6-9 credits from B A 495A(3-9)[1], B A 495B(3-9)[1], or B A 495C(3-90[1] (Sem: 7-8)

REQUIREMENTS FOR THE OPTION: 18 credits [1]
(Not all options are available at every campus.)

ENTREPRENEURSHIP OPTION: 18 credits

PRESCRIBED COURSES (12 credits)
ENTR 300(3), ENTR 320(3) (Sem: 5-6)
ENTR 400(3), ENGL 419(3) (Sem: 7-8)

ADDITIONAL COURSES (6 credits)
ENTR 410(3), ENTR 420(3), ENTR 430(3), or ENTR 440(3) (Sem: 5-8)
CAS 252(3), CAS 352(3), or SPCOM 350(3) (Sem: 7-8)

FINANCIAL SERVICES OPTION: 18 credits

PRESCRIBED COURSES (12 credits)
FINSV 400(3), FINSV 411(3), INS 301(3) (Sem: 5-8)
ENGL 419(3) (Sem: 7-8)
ADDITIONAL COURSES (6 credits)
ECON 351(3), FINSV 420(3), INS 310W(3), or R EST 301(3) (Sem: 5-8)
CAS 250(3), CAS 252(3), or CAS 352(3) (Sem: 5-8)

HEALTH SERVICES OPTION: 18 credits

PRESCRIBED COURSES (12 credits)
H P A 101(3) (Sem: 5-6)
H P A 310(3), H P A 332(3) (Sem: 5-8)
ENGL 419(3) (Sem: 7-8)

ADDITIONAL COURSES (6 credits)
CAS 250(3), CAS 252(3), or CAS 352(3) (Sem: 5-8)
H P A 447(3) or H P A 455(3) (Sem: 7-8)

INDIVIDUALIZED BUSINESS OPTION: 18 credits
Prepare an individualized plan of study consisting of 18 credits to be submitted for approval by an adviser. (Sem: 5-8)

MANAGEMENT AND MARKETING OPTION: 18 credits

PRESCRIBED COURSES (3 credits)
ENGL 419(3) (Sem: 7-8)

ADDITIONAL COURSES (15 credits)
Select 12 credits from the following (at least 3 credits in MGMT and at least 3 credits in MKTG):
BA 250(3), MGMT 321(3), MGMT 341(3), MKTG 220(3), MKTG 310(3), MKTG 327(3), MKTG 330(3), MKTG 342(3), MKTG 422(3) (Sem: 5-8)
CAS 250(3), CAS 252(3), or CAS 352(3) (Sem: 5-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
[48] Abington College and Altoona College students are required to take MATH 110 GQ(4) or MATH 140 GQ(4) and CMPSC 203 GQ(4).
[64] B LAW 243(3), FIN 100(3), MGMT 100W(3), and MKTG 221(3) may be substituted for B A 243(4), FIN 301(3), MGMT 301(3), and MKTG 301(3), respectively, with the approval of the college.
[73] Berks-Lehigh Valley College and Commonwealth College students are required to take MATH 021 GQ(3) and MATH 022 GQ(3) and CMPSC 203 GQ(4) or M I S 103(3).

BUSINESS ECONOMICS

Penn State Erie, The Behrend College

Business Economics is a quantitative oriented program of study in applied economics, with a strong business focus. Use of mainframe and microcomputers as analytical and problem-solving tools is emphasized in the program's upper-division courses. Students may choose their upper-division courses in several areas of specialization, including business cycles and forecasting, economic theory, international economics, labor economics, managerial economics, money and banking, and urban and regional economics.

For the B.S. Degree in Business Economics, a minimum of 125 credits is required. Each student must earn at least a grade of C in each 300- and 400-level course in the major field.

GENERAL EDUCATION: 45 credits
(15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 1 credit

REQUIREMENTS FOR THE MAJOR: 94 credits
(This includes 15 credits of General Education courses: 6 credits of GQ courses; 6 credits of GS courses; 3 credits of GWS courses.)

PRESCRIBED COURSES (54 credits)
CMPSC 203 GQ(4) (Sem: 1-2)
ACCTG 211(4), B A 243(4), ECON 002 GS(3), ECON 004 GS(3), ENGL 202D GWS(3), M I S 204(2), MS&IS 200(4) (Sem: 3-4)
ECNS 485(3), ECON 302 GS(3), ECON 304 GS(3), FNC 300(3), MANGT 300(3), MANGT 310(3), MRKTG 300(3) (Sem: 5-6)

ECNS 470(3) (Sem: 5-8)
MANGT 470W(3) (Sem: 7-8)

ADDITIONAL COURSES (16 credits)
[Some courses in this category have prerequisites that are not required in the program.]
MATH 110 GQ(4) or MATH 140 GQ(4) (Sem: 1-2)
Select 12 credits from ECNS 410(3), ECNS 430(3), ECNS 440(3), ECNS 450(3), ECNS 460(3), or ECNS 462(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (24 credits)
Select 9 credits of 300- or 400-level economics or other business courses (see school list of approved courses) (Sem: 5-8)
Select 15 credits from one of the following nonbusiness supporting course areas: international studies, education abroad, foreign language, or quantitative methods (see school list of approved courses). Students selecting the quantitative methods area must select ECNS 460 and ECNS 462 from the supporting course list (at least 6 credits must be at the 300 or 400 level). (See the admission section of the general information in the front of this bulletin for the placement policy for Penn State foreign language courses.) (Sem: 1-8)

BUSINESS, GENERAL

The Capital College

This major in General Business is an upper division, professionally oriented business program designed for students who want a broad-based, general preparation coupled with applied study in a practical setting such as in the area of small business. It also allows students with specific career goals to develop, in consultation with an adviser, a limited specialty in business administration that meets their personal and professional needs.

For the B.S. degree in General Business, a minimum of 122 credits is required. At least 50 percent of the business credit hours required for the degree must be taken at the Capital College. No more than 61 credits should be from business and business-related courses.

ENTRY TO MAJOR REQUIREMENTS: Entry to the General Business major requires the completion of 9 entry-to-major courses: ENGL 015 GWS(3) or ENGL 030 GWS(3), MATH 110 GQ(4) or MATH 140 GQ(4), ACCTG 211(4), CMPSC 203 GQ(4) or M I S 103(3), M I S 204(2), STAT 200 GQ(4) or MS&IS 200(4), ECON 002 GS(3), ECON 004 GS(3), B A 243(4) and a 2.00 or higher cumulative grade-point average.

CHANGE-OF-ASSIGNMENT RECOMMENDATION: This program is available in its entirety only at Penn State Schuylkill. Students should request a change-of-assignment to Penn State Schuylkill any time through their sixth semester.

GENERAL EDUCATION: 45 credits
(10-12 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of the Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 4-8 credits

REQUIREMENTS FOR THE MAJOR: 81-83 credits
(This includes 10-12 credits of General Education courses: 3 credits of GWS courses; 3 credits of GS courses; 4-6 credits of GQ courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 57-58 credits

PRESCRIBED COURSES (46 credits)
ECON 002 GS(3), ECON 004 GS(3) (Sem: 1-2)
ACCTG 211(4), B A 243(4), M I S 204(2) (Sem: 3-4)
ENGL 202D GWS(3) (Sem: 3-4)
BUS 305(3)[1], BUS 340(3), BUS 361(3)[1], FINAN 320(3)[1](Sem: 5-6)
INFSY 390(3), MNGMT 310(3)[1], MRKT 370(3)[1] (Sem: 5-6)
BUS 364W GI(3), BUS 462(3) (Sem: 7-8)

ADDITIONAL COURSES (11-12 credits)
Select 4 credits from MATH 110 GQ(4) or MATH 140 GQ(4) (Sem: 3-4)
Select 4 credits from MS&IS 200(4) or STAT 200 GQ(4) (Sem: 3-4)
Select 3-4 credits from CMPSC 203 GQ(4) or M I S 103(3)

REQUIREMENTS FOR THE OPTION: 24-25 credits

BUSINESS STUDIES OPTION: 24-25 credits
(At least 12 credits in Additional or Supporting courses must be at the 400 level.)

SUPPORTING COURSES AND RELATED AREAS (24-25 credits)
Select 24-25 credits in general business in consultation with an adviser and with program approval to reflect student's professional interests (should include at least one course which emphasizes computer application). (Sem: 5-8)

ENTREPRENEURSHIP OPTION: 24-25 credits
(At least 6 credits in Additional or Supporting courses must be at the 400 level.)

PRESCRIBED COURSES (6 credits)
MNGMT 451(3), MRKT 476(3) (Sem: 5-6)

ADDITIONAL COURSES (12 credits)
Select 12 credits from B A, BUS, H C M, INFSY, MNGMT, MRKT (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (6-7 credits)
Select 6-7 credits in general business in consultation with an adviser to reflect student's professional interests (Sem: 7-8)

FINANCIAL OPERATIONS OPTION: 24-25 credits
(At least 12 credits in Additional or Supporting courses must be at the 400 level.)

PRESCRIBED COURSES (6 credits)
ECNMS 313(3), ACCT 301(3) (Sem: 5-6)

ADDITIONAL COURSES (12 credits)
Select 12 credits from B A, BUS, FINAN, H C M, INFSY, ACCT (should include at least one course which emphasizes computer application) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (6-7 credits)
Select 6-7 credits in general business in consultation with an adviser to reflect student's professional interests. (Sem: 7-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

BUSINESS, LIBERAL ARTS, AND SCIENCE

Penn State Erie, The Behrend College
This interdisciplinary major provides students with considerable flexibility for customizing a program of study designed to meet individual interests and career goals. Depth of knowledge is achieved through the selection of modules that form the basis of the major. Students select three modules, each of which contains 15 or 16 credits and encompasses a discrete subject area. One of the modules involves course work in business disciplines; the other two modules involve course work in nonbusiness disciplines. Proper selection of modules helps provide strong preparation for careers in business and government or for entry into graduate school.

For the B.S. degree in Business, Liberal Arts, and Science, a minimum of 125 credits is required. Each student must earn at least a grade of C in each 300- and 400-level course in the major field.

GENERAL EDUCATION: 45 credits
(15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 1 credit

REQUIREMENTS FOR THE MAJOR: 94-95 credits
(This includes 15 credits of General Education courses: 6 credits of GQ courses; 6 credits of GS courses; 3 credits of GWS courses.)
PRESCRIBED COURSES (42 credits)
CMPSC 203 GQ(4) (Sem: 1-2)
ACCTG 211(4), B A 243(4), ECON 002 GS(3), ECON 004 GS(3), ENGL 202D GWS(3), M I S 204(2), MS&IS 200(4) (Sem: 3-4)

FNC 300(3), MANGT 300(3), MANGT 310(3), MRKTG 300(3) (Sem: 5-6)
MANGT 470W(3) (Sem: 7-8)

ADDITIONAL COURSES (7 credits)
MATH 110 GQ(4) or MATH 140 GQ(4) (Sem: 1-2)
Select 3 credits from ECNS 470(3), MANGT 480 GI(3), MRKTG 470 GI(3), or other 400-level international business course (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (45-46 credits)
[Some courses in this category may have prerequisites that are not required for the major.]
Select one module from Modules 1-5 (15-16) (Sem: 5-8)
Select one module from Modules 8, 11, 12, or 14 (15) (Sem: 5-8)
Select one module from Modules 6-18 (15) (Sem: 5-8)

Except where noted, courses taken to satisfy General Education requirements may not be used to satisfy module requirements.

Module 1 ACCOUNTING (16 credits)
ACNTG 310(4) Intermediate Accounting I
ACNTG 320(3) Federal Income Taxation
ACNTG 412(3) Cost Accounting
Select 6 credits in ACNTG (including at least 3 credits at the 400 level)
Completion of this module in addition to ACCTG 211(4) fulfills the requirements for a minor in Accounting.

Module 2 ECONOMIC ANALYSIS AND POLICY (15 credits)
Select 15 credits in ECON or ECNS (including at least 6 credits at the 400 level)
Completion of this module in addition to ECON 002 GS(3) and ECON 004 GS(3) fulfills the requirements for a minor in Economics.

Module 3 LABOR RELATIONS AND HUMAN RESOURCES MANAGEMENT (15 credits)
Select 15 credits from:
ECNS 410(3) Economics of Labor Markets
L I R 100 GS(3) Labor and Industrial Relations
MANGT 330(3) Organizational Processes and Structure
MANGT 340 GI(3) Introduction to Human Resource Management
MANGT 420(3) Conflict Management
MANGT 440(3) Advanced Human Resource Management
Completion of 12 credits of MANGT courses in addition to MANGT 300(3) and MANGT 470W(3) fulfills the requirements for a minor in Management.

Module 4 QUANTITATIVE METHODS FOR BUSINESS (15 credits)
Select 15 credits from:
ECNS 460(3) Business Forecasting Techniques
ECNS 462(3) Advanced Business Forecasting Techniques
ECNS 485(3) Econometric Techniques
MANGT 350(3) Problem Solving and Models for Management
MANGT 450(3) Operations Planning and Control
MANGT 455(3) Logistics Systems Analysis and Design
MANGT 460(3) Purchasing and Material Management
Completion of 12 credits of MANGT courses in addition to MANGT 300(3) and MANGT 470W(3) fulfills the requirements for a minor in Management.

Module 5 MANAGEMENT INFORMATION SYSTEMS (15 credits)
Select 15 credits from:
MISBD 336(3) Data Management Systems
MISBD 430(3) Systems Analysis
Select 9 credits in CMPBD, CMPSC, or MISBD (including at least 3 credits at the 400 level)
Completion of this module in addition to CMPSC 203 GQ(4) and M I S 204(2) fulfills the requirements for a minor in MISBD.

Module 6 COMMUNICATIONS (15 credits)
Select 15 credits in COMM, COMMU, or SPCOM (including at least 6 credits at the 400 level)

Module 7 ENGLISH (15 credits)
Select 15 credits in ELISH or ENGL (beyond the Writing/Speaking area of General Education, and including at least 6 credits at the 400 level)

Module 8 FOREIGN LANGUAGE (15 credits)
Select 12 credits in one foreign language
Select 3 credits in a corresponding area studies course in consultation with adviser [e.g., GER 200 GH;GI(3), HIST 179 GH;GI(3), PL SC 020 GS(3)]

Module 9 HISTORY (15 credits)
Select 15 credits in HIST or HSTRY (including at least 6 credits at the 400 level)

Module 10 POLITICAL SCIENCE (15 credits)
PL SC 001 GS(3) Introduction to American National Government
PL SC 003 GS(3) Introduction to Comparative Politics
Select 9 credits in PL SC or POLSC (including at least 6 credits at the 400 level)

Module 11 INTERNATIONAL CULTURAL STUDIES (15 credits)
COMMU 402 GI(3) International and Intercultural Communication
INTST 100 GS;GI(3) Introduction to International Studies
INTST 400W(3) Seminar in International Studies
Select 6 credits from:
FR 139 GH;DF(3) France and the French-speaking World
GER 200 GH;GI(3) Contemporary German Culture
RL ST 001 GH;GI(3) Introduction to World Religions
RL ST 004 GH;GI(3) Jewish and Christian Foundation
RUS 100 GH;DF(3) Russian Culture and Civilization
RUS 130 DF(3) Women in Russian Literature
SPAN 130 GH;DF(3) Iberian Civilization
SPAN 131 GH;DF(3) Ibero-American Civilization or other international cultures courses in consultation with adviser

Module 12 INTERNATIONAL POLICY STUDIES (15 credits)
Select 15 credits from:
PL SC 003 GS(3) Introduction to Comparative Politics
PL SC 014 GS(3) International Relations
PL SC 020 GS(3) Comparative Politics--Western Europe
PL SC 022 DF(3) Politics of the Developing Areas
POLSC 305(3) Comparative Public Policy
POLSC 421(3) Failure of Communism in Eastern Europe
POLSC 423(3) Foundations of Soviet Political Life
POLSC 428(3) International Law and Organizations
POLSC 471(3) Public Policy Analysis or other international policy courses in consultation with adviser

Module 13 PSYCHOLOGY (15 credits)
PSY 002 GS(3) Psychology
Select 12 credits in PSY or PSYCH (including at least 6 credits at the 400 level)

Module 14 EDUCATION ABROAD (15 credits)
Select an Education Abroad Program in consultation with adviser

Module 15 COMPUTER STUDIES (15 credits)
Select 15 credits in CMPSC or CMPBD (including at least 6 credits at the 400 level)

Module 16 MATHEMATICS (15 credits)
Select 15 credits in MATH or MTHBD (including at least 6 credits at the 400 level)

Module 17 SCIENCE (15 credits)
Select 15 credits in the natural sciences (including at least 6 credits at the 400 level)

Module 18 STATISTICS AND QUALITY CONTROL (15 credits)
STABD 444(3) Analysis of Variance
MTHBD 450(3) Mathematical Methods of Operations Research
Q C 450(3) Introduction to Quality Control Engineering
STAT 460(3) Intermediate Applied Statistics
STAT 462(3) Applied Regression Analysis
STAT 464(3) Applied Nonparametric Statistics or other courses in MATH, MTHBD, Q C, or STAT in consultation with adviser

CHEMICAL ENGINEERING

College of Engineering

The undergraduate program in chemical engineering is designed to reflect the growing impact of chemical engineers beyond the chemical and petroleum industries. The program integrates traditional chemical engineering with studies in materials, environmental, biomedical and biotechnology fields. The program imparts skills that will allow the chemical engineer to play an increasing role in government agencies, financial institutions, and consulting firms, as well as law and medicine.

To educate the modern chemical engineer, the program focuses on the training of students to solve problems which involve the complex coupling of many factors with requisite emphasis on analysis, synthesis, and design. The program builds on its traditional foundation of applications in the chemical process industries while expanding student exposure to various new fields of activity. The scholarly and research activities of the faculty are integrated into the core program of courses and specialty elective courses. Diverse opportunities are offered for students to pursue interdisciplinary studies through options in Polymer Engineering, Bioprocess Engineering, and Fuels and Energy Engineering, in conjunction with the faculty and the facilities in other engineering, physical and life sciences departments. The curriculum is structured to train our graduates to be problem solvers and leaders.

The undergraduate degree program in Chemical Engineering will provide the successful graduate with: (1) fundamental knowledge in basic mathematical, physical, chemical and biological sciences required in engineering problem solving; (2) the ability to define, analyze and solve practical, complex, chemical engineering problems; (3) the operational principles of process and equipment design; (4) sensitivity for environmental, ethical and societal concerns relating to the technological issues; (5) experience in working as a member of a team, and extensive experience in oral and written communications; and (6) the foundation for continuous learning throughout the professional life.

For the B.S. degree in Chemical Engineering, a minimum of 134 credits is required. This baccalaureate program in Chemical Engineering is accredited by the Engineering Accreditation Commission of ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202-4012; telephone 410-347-7700; or **www.abet.org**.

GENERAL EDUCATION: 45 credits
(21 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 110-111 credits
(This includes 21 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses; 3 credits of GWS courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 84 credits

PRESCRIBED COURSES (77 credits)
CHEM 012 GN(3), CHEM 013 GN(3), CHEM 014 GN(1), CHEM 015 GN(1), ED&G 100(3), MATH 140 GQ(4), MATH 141 GQ(4), PHYS 211 GN(4) (Sem: 1-2)
CH E 301(3)[1], CH E 302A(3)[1], CH E 302B(2)[1],CH E 303(3)[1], CH E 304(2)[1], CHEM 036(2), CHEM 038(3), CHEM 039(3), MATH 220 GQ(2), MATH 231(2), MATH 251(4), PHYS 212 GN(4) (Sem: 3-6)
CH E 413(3)[1], CH E 414(3)[1], CHEM 451(3), ENGL 202C GWS(3) (Sem: 5-6)
CH E 401(3), CH E 407W(3), CH E 450(3) (Sem: 7-8)

ADDITIONAL COURSES (7 credits)
Select 1 credit of First-Year Seminar (Sem: 1-2)
CMPSC 201C GQ(3) or CMPSC 201F GQ(3) (Sem: 3-6)
ECON 002 GS(3), ECON 004 GS(3), or ECON 014 GS(3) (Sem: 5-6)

REQUIREMENTS FOR THE OPTION (26-27 credits)

BIOPROCESS ENGINEERING OPTION (27 credits)

PRESCRIBED COURSES (24 credits)
MICRB 201(3) (Sem: 3-4)
B M B 251(3), CH E 012(1), CH E 438(3), CHEM 457(2) (Sem: 5-6)
CH E 409(3), CH E 448(3), CH E 455(3), CH E 464(3) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (3 credits)
Select 3 credits from department list (Sem: 5-8)

ENERGY AND FUELS OPTION (26 credits)

PRESCRIBED COURSES (20 credits)
F SC 012(1), F SC 401(3), F SC 431(3) (Sem: 5-6)
F SC 410(2), F SC 432(3)/CH E 432(3), F SC 422(3), F SC 464(3), PHYS 214 GN(2) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (6 credits)[31]
Select 3 credits of 400-level chemical engineering courses from department list.
Select 3 credits from department list (Sem: 7-8)

GENERAL OPTION (26 credits)

PRESCRIBED COURSES (8 credits)
PHYS 214 GN(2) (Sem: 3-4)
CH E 012(1), CHEM 457(2) (Sem: 5-6)
CH E 464(3) (Sem: 7-8)

ADDITIONAL COURSES (9 credits)
Select 3 credits of 400-level chemistry courses from department list (Sem: 5-6)
Select 6 credits of 400-level chemical engineering courses from department list (Sem: 5-6)

SUPPORTING COURSES AND RELATED AREAS (9 credits)[31]
Select 6 credits from department list (Sem: 5-8)
Select 3 credits of other courses from department list (Sem: 7-8)

POLYMER ENGINEERING OPTION (26 credits)

PRESCRIBED COURSES (21 credits)[31]
PHYS 214 GN(2) (Sem: 3-4)
CH E 012(1), CH E 441(3), CHEM 457(2), MATSE 443(3), MATSE 446(3) (Sem: 5-6)
CH E 464(3), MATSE 441(3) (Sem: 7-8)

ADDITIONAL COURSES (6 credits)
Select 6 credits of 400-level polymer science courses from department list (Sem: 7-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
[31] Students may substitute 6 credits of ROTC for part of this requirement in consultation with department.

CHEMISTRY

Penn State Erie, The Behrend College

This major provides a strong foundation in chemistry and prepares students for graduate or professional programs and for careers with companies and agencies requiring chemistry or related areas. The major has five options that allow students to choose an area of specialization to meet their career goals. These options are: general chemistry, biochemistry, business, computer science, and chemistry education pre-certification. Students have the opportunity to participate in research with faculty members.

For the B.S. degree in Chemistry, a minimum of 124 credits is required. Each student must earn at least a grade of C in each 300- and 400-level course in the major field and must have earned a minimum 2.00 grade-point average.

GENERAL EDUCATION: 45 credits
(18-24 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 0-6 credits

REQUIREMENTS FOR THE MAJOR: 91-100 credits
(This includes 18-24 credits of General Education courses. For the General Chemistry option, Biochemistry option, and Computer Science option, 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GWS courses. For the Business option, 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses; 3 credits of GWS courses. For the Chemistry Education Pre-Certification option, 9 credits of GN courses; 6 credits of GQ courses; 6 credits of GS courses; 3 credits of GWS courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 57-58 credits

PRESCRIBED COURSES (52 credits)
CHEM 012 GN(3)[1], CHEM 013 GN(3)[1], CHEM 014 GN(1)[1], CHEM 015 GN(1)[1], MATH 140 GQ(4)[1], MATH 141 GQ(4)[1], PHYS 211 GN(4)[1], PHYS 212 GN(4)[1], PHYS 213 GN(2)[1], PHYS 214 GN(2)[1] (Sem: 1-4)
CHEM 036(2)[1], CHEM 038(3)[1], CHEM 039(3)[1], CHMBD 221(4)[1] (Sem: 3-6)
CHMBD 407(1), CHMBD 412W(4), CHMBD 441(4), CHMBD 445(3) (Sem: 5-8)

ADDITIONAL COURSES (5-6 credits)
Select 2 credits from CHMBD 446(1), CHMBD 447(1), CHMBD 448(1) (Sem: 5-8)
Select 3-4 credits from MATH 220 GQ(2)[1] and MATH 231(2)[1] or MATH 250(3)[1] (Sem: 3-6)

REQUIREMENTS FOR THE OPTION: 34-42 CREDITS

GENERAL CHEMISTRY OPTION: 34 credits

PRESCRIBED COURSES (7 credits)
CHMBD 442(4), ENGL 202C GWS(3)[1] (Sem: 3-8)

ADDITIONAL COURSES (9 credits)
Select 6 credits of 400-level CHEM or CHMBD courses (excluding CHMBD 494, CHMBD 495, and CHMBD 496) (Sem: 5-8)
Select 3 credits from CHMBD 494(1-12) or CHMBD 496(1-18) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (18 credits)
Select 18 credits from school-approved list. (Students may apply up to 6 credits of ROTC.) (Sem: 1-8)

BIOCHEMISTRY OPTION: 41-42 credits

PRESCRIBED COURSES (22 credits)
BIOBD 452(3), BIOL 110S GN(4)[1], BIOL 230W GN(4)[1] (Sem: 3-8)
CHMBD 442(4), CHMBD 451(3), CHMBD 453(1) (Sem: 5-8)
ENGL 202C GWS(3)[1] (Sem: 3-8)

ADDITIONAL COURSES (13-14 credits)
Select 7-8 credits from BIOBD 322(3), BIOBD 445(3), BIOBD 449(3), BIOBD 460(3), BIOBD 465(3), BIOL 240W GN(4)[1], MICRB 201(3), MICRB 202(2) (Sem: 3-8)
Select 3 credits of 400-level CHEM or CHMBD courses (excluding CHMBD 494, CHMBD 495, and CHMBD 496) (Sem: 5-8)
Select 3 credits from CHMBD 494(1-12) or CHMBD 496(1-18) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits from school-approved list. (Students may apply up to 6 credits of ROTC.) (Sem: 1-8)

BUSINESS OPTION: 40-42 credits

PRESCRIBED COURSES (15 credits)
ECON 002 GS(3)[1], ENGL 202D GWS(3)[1], MANGT 300(3), MRKTG 300(3) (Sem: 3-8)
CHMBD 496(3) (Sem: 5-8)

ADDITIONAL COURSES (19-21 credits)
Select 6 credits of 400-level CHEM or CHMBD courses (excluding CHMBD 494, CHMBD 495, and CHMBD 496) (Sem: 5-8)
MS&IS 200(4) or STAT 200 GQ(4) (Sem: 3-6)
Select 9-11 credits in one of the following sequences:
a) MANGT 310(3), MANGT 330(3), MANGT 410(3), MANGT 420(3) (Sem: 5-8)
b) MRKTG 310(3), MRKTG 320(3), MRKTG 400(3), MRKTG 410(3), MRKTG 420(3) (Sem: 5-8)
c) CMPSC 203 GQ(4), M I S 204(2), MISBD 336(3), MISBD 430(3), MISBD 445(3) (Sem: 5-8)
d) One selection each from a), b), and c) above (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits from school-approved list. (Students may apply up to 6 credits of ROTC.) (Sem: 1-8)

COMPUTER SCIENCE OPTION: 39 credits

PRESCRIBED COURSES (15 credits)
CHMBD 442(4), CMPBD 127(1)[1], CSE 103 GQ(4)[1], CSE 120(3)[1], ENGL 202C GWS(3)[1] (Sem: 3-8)

ADDITIONAL COURSES (18 credits)
Select 3 credits of 400-level CHEM or CHMBD courses (excluding CHMBD 494, CHMBD 495, and CHMBD 496) (Sem: 5-8)
Select 3 credits from CHMBD 494(1-12) or CHMBD 496(1-18) (Sem: 5-8)
Select 12 credits from CMPBD 210(3)[1], CMPBD 350(3), CMPBD 360(3), CMPBD 410(3), CMPBD 411(3), CMPBD 423(3), CMPBD 424(3), CMPBD 460W(3), CSE 260(3)[1] (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits from school-approved list. (Students may apply up to 6 credits of ROTC.) (Sem: 1-8)

CHEMISTRY EDUCATION PRECERTIFICATION OPTION: 40-41 credits
This option helps prepare students for chemistry education teaching positions in secondary schools. It includes the academic requirements for the Chemistry Education Instructional 1 certificate issued by the Pennsylvania Department of Education. Students in this option must graduate with 3.0 GPA or better to be admitted to the fifth year teacher's certification program at Mercyhurst College, Erie, Pennsylvania.

PRESCRIBED COURSES (22-23 credits)
CHMBD 442(4), CHMBD 451(3), ENGL 202C GWS(3)[1], PSY 002 GS(3)[1] (Sem: 3-8)
EDPSY 014(3) taken concurrent with C I 295(1), EDTHP 115(3) taken concurrent with C I 295(1) (Sem:3-8)
CHEM 395(1-2) (Sem: 5-8)

ADDITIONAL COURSES (9 credits)
Select 3 credits of 400-level CHEM or CHMBD courses (excluding CHMBD 494, CHMBD 495, and CHMBD 496) (Sem: 5-8)
Select 3 credits from CHMBD 494(1-12) or CHMBD 496(1-18) (Sem: 5-8)
HD FS 129 GS(3)[84] or PSY 213 GS(3)[84] (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 9 credits from school-approved list. (Students may apply up to 6 credits of ROTC.) (Sem: 1-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
[84] A student enrolled in this option must receive a grade of B or better to meet Mercyhurst College's requirements.

CHEMISTRY

Eberly College of Science

This major provides a strong foundation in the facts and principles of chemistry. Mathematics and physics are emphasized, since these subjects are essential to the understanding of chemistry. Courses in English and a foreign language and electives ensure study in nontechnical subjects. This arrangement broadens the student's general education and enables him or her to relate the major to other fields of knowledge.

In order to be eligible for entrance to the Chemistry major, a student must have: 1) Attained at least a 2.00 cumulative grade-point average. 2) Completed CHEM 012 GN(3), CHEM 013 GN(3), CHEM 014 GN(1), CHEM 015 GN(1), CHEM 038(3), MATH 140 GQ(4), MATH 141 GQ(4), and MATH 231(2); earned a grade of C or better in each of these courses; and earned a combined grade point average of at least 2.50 in these courses. (Note: If courses are repeated, only the better grade will be used in this calculation.)

For the B.S. degree in Chemistry, a minimum of 125 credits is required.

GENERAL EDUCATION: 45 credits
(15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 1 credit

REQUIREMENTS FOR THE MAJOR: 94 credits
(This includes 15 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses.)

PRESCRIBED COURSES (55 credits)
CHEM 012 GN(3)[1], CHEM 013 GN(3)[1], CHEM 014 GN(1)[1], CHEM 015 GN(1)[1], MATH 140 GQ(4)[1], MATH 141 GQ(4)[1] (Sem: 1-2)
PHYS 201 GN(4) or PHYS 211 GN(4); PHYS 202 GN(4) or PHYS 212 GN(4) (Sem: 1-4)
CHEM 016(1), CHEM 036(2)[1], CHEM 038(3)[1], CHEM 039(3)[1], CHEM 431W(3), CHEM 451(3)[1], CHEM 452(3)[1], CHEM 457(2), MATH 231(2)[1], MATH 250(3) (Sem: 3-4)

PHYS 204 GN(4) or PHYS 213 GN(2) and PHYS 214 GN(2) (Sem: 3-6)
MATH 220 GQ(2) (Sem: 5-6)

ADDITIONAL COURSES (21 credits)
CHEM 425(3) or CHEM 426(3) (Sem: 5-8)
Select 18 credits of chemistry at the 400 level. Up to 3 co-op credits (1 each of SC 295, SC 395, SC 495) may be used in this category. CHEM 489(1-10) may be used, but the total of CHEM 489 credits plus co-op credits may not exceed 8. (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (18 credits)
Up to 8 credits may be used to achieve the II level of a foreign/second language in which a significant chemical literature is produced (German or Russian is recommended). The remaining 10-18 credits may include any courses not on the department list of courses that do not count toward graduation. Only one credit of each of SC 295, SC 395, and SC 495 is allowed in this category. Chemical Research (Chem 489 or Chem 496) does not count in this category. (Sem: 3-6)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

CIVIL ENGINEERING

College of Engineering
The program in Civil and Environmental Engineering provides the basic undergraduate education required for private practice and public service in civil and environmental engineering, and/or continued formal education at the graduate level. The goals of the program are identical to those described under the heading of the College of Engineering. Emphasis is placed on the fundamentals of civil engineering principles and design techniques. Students learn the basic engineering science concepts needed for this major through required Civil Engineering course work. They are given the opportunity to become familiar with the main discipline of the field (construction, environmental, hydrosystems, structures, and transportation) through a series of elective courses. Courses in communication skills, arts, humanities, social and behavioral sciences, and other engineering disciplines broaden the program. Students gain experience in working as members of a team and in using interdisciplinary approaches to solve problems. These experiences, as well as those related to engineering principles and design, are taught through exercises in the classroom, laboratory, and field. The program culminates with capstone design courses in which the students' knowledge and skills are applied to actual engineering problems.

For the B.S. degree in Civil Engineering, a minimum of 134 credits is required. This baccalaureate program in Civil Engineering is accredited by the Engineering Accreditation Commission of ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202-4012; telephone 410-347-7700; or **www.abet.org**.

GENERAL EDUCATION: 45 credits
(21 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 108 credits
(This includes 21 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses; 3 credits of GWS courses.)

PRESCRIBED COURSES (71 credits)
CHEM 012 GN(3), CHEM 014 GN(1), E MCH 011(3)[1], MATH 140 GQ(4), MATH 141 GQ(4), PHYS 211 GN(4) (Sem: 1-2)
E MCH 012(3)[1], E MCH 013(3)[1], STAT 401(3), GEOSC 001(3), MATH 220 GQ(2), MATH 251(4), PHYS 212 GN(4) (Sem: 3-4)
C E 300(1), C E 310(3)[1], C E 335(3)[1], C E 336(4)[1], C E 340(3)[1], C E 360(3)[1], ENGL 202C GWS(3) (Sem: 5-6)

ADDITIONAL COURSES (37 credits)
C E 100S(1), 1 credit of First-Year Seminar or elective (Sem: 1-2)
ED&G 100(3) (Sem: 1-2)
CMPSC 201C GQ(3) or CMPSC 201F GQ(3) (Sem: 3-4)
ECON 002 GS(3), ECON 004 GS(3), or ECON 014 GS(3) (Sem: 3-4)
M E 023(3) or CH E 303(3)[30] (Sem: 5-6)
E E 220(3) or E E 305(3)[30] (Sem: 7-8)
Select 18 credits from C E 321(3), C E 332(3), C E 341(3), C E 342(3), C E 361(3), C E 362(2), C E 363(1), C E 370(3), C E 371(3), C E 422(3), C E 423(3), C E 424(3), C E 432(3), C E 435(3), C E 436(3), C E 447(3), C E 462(3), C E 475(3), C E 476(3), C E 479(1) (Sem: 5-8)[#]

Select 3 credits of C E 410W(3), C E 421W(3), C E 438W(3), C E 448W(3), C E 465W(3), C E 472W(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS: (12 credits)
Select 3 credits of general elective from approved department list[30] (Sem: 5-6)
Select 9 credits of technical elective from C E 300-level courses, 400-level courses, or department list. (Sem: 7-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
[30] Students may substitute 6 credits of ROTC for 3 credits of 400-level C E courses and 3 credits of M E or E E.
[#] Those courses must be selected from at least 4 of the 5 technical areas in the Civil Engineering program—transportation (x20), construction (x30), structures (x40), hydrosystems (x60), and environmental (x70).

CLASSICS AND ANCIENT MEDITERRANEAN STUDIES

College of the Liberal Arts

Classics and Ancient Mediterranean Studies is concerned with the civilizations of the ancient Mediterranean world, including the ancient Greeks, Romans, and the peoples of Egypt and the Near East. The study of these civilizations includes their languages and literatures, history and politics, religion and mythologies, philosophies, and material culture. Students electing the CAMS major follow one of three options. The Ancient Mediterranean Archaeology (AMA) option is designed for students interested in the physical evidence for ancient Mediterranean cultures, including the rise and development of settlements and cities; ceramics, metals, stone, and organic remains; and population changes over time. The Classical Language option requires study of Greek or Latin, or a combination of both languages, and is recommended especially for students planning to pursue any classical subject in graduate school or to teach Latin at the secondary level. Students in the Classical Language option are urged to schedule one course in historical linguistics or comparative grammar. The Classics and Ancient Mediterranean Studies (CAMS) option is suitable for students interested in a broadly interdisciplinary study of the cultures of the ancient Mediterranean and does not require study of language, although students are encouraged to study the appropriate ancient languages. All students in the major are particularly encouraged to participate in one of the Penn State Education Abroad Programs and/or archaeological field schools in the Mediterranean area. Approved archaeological fieldwork is required for the AMA option. Up to 15 credits of appropriate education abroad courses may be applied to requirements for the major.

For the B.A. degree in Classics and Ancient Mediterranean Studies, a minimum of 123 credits is required.

GENERAL EDUCATION: 45 credits
(6-9 of these 45 credits are included in the REQUIREMENT FOR THE MAJOR for the Ancient Mediterranean Archaeology option)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selections)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selections, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 21-24 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 30-39 credits[1]
(This includes 6-9 credits of General Education courses for the Ancient Mediterranean Archaeology Option: 3 credits of GA courses; 0-3 credits of GH courses; 3 credits of GS courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 18 credits
No more than 15 credits in courses numbered 099, 199, 299, 399, or 499 may count toward the requirements for the major.

PRESCRIBED COURSE (3 credits)
CAMS 400(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (15 credits)
Select 6 credits, 3 in each of the following two areas:
—3 credits in Greek or Roman literature and language, civilization, or archaeology from approved department list (Sem: 1-8)
—3 credits in Near Eastern literature and language, civilization, or archaeology from approved department list (Sem: 1-8)

Select 9 credits, at least 3 at the 400 level, from appropriate offerings in ancient history, anthropology, art history, classics and ancient Mediterranean studies, Greek, Hebrew, Jewish studies, Latin, linguistics, philosophy, or religious studies from approved department list (Sem: 1-8)

REQUIREMENTS FOR THE OPTION: 12-21 credits

ANCIENT MEDITERRANEAN ARCHAEOLOGY OPTION: 21 credits
Students in this option must complete one season of approved archaeological fieldwork at an ancient Mediterranean or related site. Up to 6 credits of fieldwork may be applied to the COMMON REQUIREMENTS FOR THE MAJOR.

ADDITIONAL COURSES (15 credits)
ANTH 002 GS(3) or ANTH 009 GS(3) (Sem: 1-4)
CAMS/HIST 100 GH(3), CAMS/HIST 101 GH(3), or HIST/J ST/RL ST 102 GH(3) (Sem: 1-4)
ART H 111 GA(3), ART H 301 GA(3), or ART H 311 GA(3) (Sem: 1-6)
Select 3 credits from the following courses: CAMS/ANTH/J ST 012 GI(3), CAMS 133 GH(3), CAMS 140(3), CAMS 150(3), CAMS 440W(3), or ANTH 420 (Sem: 1-8)
Select 3 credits from the following courses: ANTH 408(3), ANTH 410(3), ANTH 428(3), or ANTH 463(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits from the following ancient language courses: CAMS 490, 400-level Greek, or 400-level Latin (Sem: 5-8)

CLASSICAL LANGUAGE OPTION: 12 credits

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 12 credits at the 400 level in either Greek or Latin or a combination of both languages in consultation with major adviser. (Sem: 1-8)

CLASSICAL AND ANCIENT MEDITERRANEAN STUDIES OPTION: 12 credits

SUPPORTING COURSES AND RELATED AREAS: 12 credits
Select 6 credits at the 400 level from Classics and Ancient Mediterranean Studies (CAMS), Greek, or Latin courses (Sem: 5-8)
Select 6 credits at the 400 level from appropriate courses in ancient history, anthropology, Classics and ancient Mediterranean studies, Jewish studies, linguistics, philosophy, or religious studies from approved department list (Sem: 5-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

COMMUNICATION ARTS AND SCIENCES

Commonwealth College; College of the Liberal Arts
This major provides increased understanding and practice in the ways humans use symbols to influence people and the world around them. The ability to communicate effectively with others in personal, social, work and multicultural situations is essential in modern society. A student of Communication Arts and Sciences will learn to think critically, analyze and solve problems, understand and manage conflict, argue persuasively, influence people, form and keep relationships, give effective presentations, and participate in the civic and political life of a community. The flexibility of the program offers preparation for a variety of careers such as administration, law, business, health, and human services fields. A CAS degree also lends itself well to a concurrent degree program in which students prepare themselves in several fields of study.

For the B.A. degree in Communication Arts and Sciences, a minimum of 124 credits is required.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 25 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 30 credits[1]

PRESCRIBED COURSES (12 credits)
CAS 200 GI(3), CAS 201 GH(3), CAS 202 GS(3), CAS 204(3) (Sem: 3-6)

ADDITIONAL COURSES (3 credits)
Select 3 credits of skills courses from CAS 203(3), CAS 205(3), CAS 211(3), CAS 213(3), CAS 214(3), CAS 215(3), CAS 216(2), CAS 250(3), CAS 252(3), CAS 271 GI(3), CAS 280W(3), or CAS 283(3) (Sem: 3-8)

SUPPORTING COURSES AND RELATED AREAS (15 credits)
Select 15 credits of other CAS courses; at least 12 credits must be at the 400 level. A maximum of 6 credits from CAS 494, 495, 496, and 499(GI) may satisfy this requirement. CAS 126(3) and CAS 195(1) may not be counted as part of the major (Sem: 1-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

COMMUNICATION AND MEDIA STUDIES

Penn State Erie, The Behrend College
The B.A. major in Communication and Media Studies offers a liberal arts background with emphasis in mass media studies and corporate communication. It prepares students for careers in corporate communication, print and broadcast journalism, multimedia and video production, and advertising/public relations by providing an interdisciplinary study of spoken, written, visual, and technically mediated messages.

For the B.A. degree in Communication and Media Studies, a minimum of 124 credits is required.

GENERAL EDUCATION: 45 credits
(16 of these credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 16-19 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin)

REQUIREMENTS FOR THE MAJOR: 52-55 credits[1]
(This includes 16 credits of General Education courses: 3 credits of GA courses; 3 credits of GH courses; 4 credits of GQ courses; 6 credits of GS courses.)

PRESCRIBED COURSES (16 credits)
CMPSC 203 GQ(4) (Sem: 1-4)
CAS 202 GS(3), COMMU 301(3), COMMU 310(3), COMMU 383(3) (Sem: 5-6)

ADDITIONAL COURSES (21-24 credits)
ART 010 GA(3) or COMM 150 GA(3) (Sem: 1-4)
CAS 175 GH(3), CAS 201 GH(3), or PHIL 123 GH(3) (Sem: 1-4)
CAS 101 GS(3) or COMM 100 GS(3) (Sem: 1-4)
COMMU 312(3) or COMMU 325(3) (Sem: 5-6)
COMM 260W(3), COMMU 401W(3), or COMMU 421W(3) (Sem: 5-8)
COMMU 400(3) or COMMU 402 GI(3); COMMU 494(3) or COMMU 495(3-6) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (15 credits)
Select 15 credits from the department approved list (9 credits must be taken at the 400 level) (Sem: 5-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

COMMUNICATION SCIENCES AND DISORDERS

College of Health and Human Development
This major offers a comprehensive program of study for preparing students who want to become speech-language pathologists or audiologists. The curriculum is specifically designed for the sole purpose of preparing undergraduate students for graduate study in communication sciences and disorders or related areas. This occurs because state licensure laws and professional certifications require that a speech-language pathologist or audiologist must have a master's degree, pass a national test, and complete a clinical fellowship year.

Overall, the curriculum enables students to develop fundamental knowledge based on scientific principles, skills, and attitudes required for habilitating and rehabilitating persons of all ages with a wide range of speech,

language, and hearing problems. Further, the curriculum allows students an opportunity to explore all aspects of communication sciences and disorders as well as elect courses of special interest.

The first two years of study emphasize general education and background study. The last two years of study emphasize normal and disordered aspects of speech, language, and hearing as well as professional management, concerns, and obligations. Clinical observation and diversity focused course work are included in the curriculum.

For the B.S. degree in Communication Sciences and Disorders, a minimum of 120 credits is required. (To satisfy graduation requirements, students must have completed 6 credits from courses offered in the college and outside the department in which the major is offered.)

GENERAL EDUCATION: 45 credits
(6-10 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 23-28 credits

REQUIREMENTS FOR THE MAJOR: 57-58 credits
(This includes 6-10 credits of General Education courses: 6 credits of GS courses; 0-4 credits of GQ courses.)

PRESCRIBED COURSES (45 credits)
CSD 146(3)[1], CSD 230(3), CSD 245(2), CSD 269 GI(3), PSY 002 GS(3) (Sem: 1-4)
CSD 300(3)[1], CSD 301(3)[1], CSD 311(3)[1], CSD 331(3)[1], CSD 395W(1) (Sem: 3-6)
CSD 433(3), CSD 442(3), CSD 444(3), CSD 451(3), CSD 459W(3), CSD 462(3) (Sem: 5-8)

ADDITIONAL COURSES (12-13 credits)
EDPSY 014(3) or PSY 204 GS(3) (Sem: 1-4)
EDPSY 101 GQ(3), PSY 015(4), or STAT 200 GQ(4) (Sem: 3-4)
HD FS 129 GS(3) or PSY 213 GS(3) (Sem: 1-4)
HD FS 229 GS(3), HD FS 249 GS(3), HD FS 315 GI(3), HD FS 411(3), HD FS 418(3), HD FS 432(3), PSY 412(3), or PSY 437(3) (Sem: 3-6)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

COMMUNICATIONS

Altoona College

The curriculum of this B.A. in Communications provides a general grounding in traditional media forms along with work in the area of media convergence. Students must do course work at both the practical and theoretical level. On the theory side, course work will be offered in the areas of media criticism and theory, visual communications, and media history at the introductory and advanced levels. On the applied side, course work will be offered in video and audio production, newswriting and photojournalism, radio and television studio production, and public relations and advertising at the introductory and advanced levels. In the Convergent Media News Service courses, which form the most distinctive component of the program, students will actually produce and deliver a college news service in print, broadcasting (TV and streaming radio), and a multimedia online format. This hands-on experience will provide students an opportunity to create materials suitable for inclusion in a portfolio. Although not required, students will be strongly encouraged to do an internship sometime during their junior or senior years. Finally, the capstone Convergent Media Seminar will bring seniors together to consider the larger, theoretical issues related to the fast-paced changes in communications today and into the future. With a degree in this program, students will be well-positioned to go right into industry, where they will be able to compete in a number of different job markets, or to graduate school for advanced training.

For the B.A. in Communications, a minimum of 123 credits is required.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin)

FIRST-YEAR SEMINAR: (Included in ELECTIVES OR GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 12 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 42 credits[1]

PRESCRIBED COURSES (12 credits)
COMM 100 GS(3), COMM 150 GA(3) (Sem: 1-3)
COMM 260W(3) (Sem: 2-3)
COMM 490(3) (Sem: 7-8)

ADDITIONAL COURSES (30 credits)
Select 12 credits from the following, including 6 credits at 400-level: COMM 242(3), COMM 269(3), COMM 270(3), COMM 345(3), COMM 347(3) (Sem: 3-6)
COMM 421W(3), COMM 454(3), COMM 461(3), COMM 467(3), COMM 468(3), COMM 471(3) (Sem: 5-8)
Select 12 credits from the following, including 6 credits at 400-level: COMM 180(3), COMM 205 GI(3), COMM 250 GA(3), COMM 261 GH(3), COMM 320(3), COMM 370(3) (Sem: 3-6)
COMM 401(3), COMM 403(3), COMM 408(3), COMM 409(3), COMM 411(3), COMM 413(3) (Sem: 5-8)
Select 6 credits from COMM 470A(3), COMM 470B(3), COMM 470C(3) (Sem: 7-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44..

COMMUNICATIONS

Capital College

The is an interdisciplinary program that combines practical, professional instruction with critical and cultural examinations of mass media. Our interdisciplinary and theoretical approach enables our students to understand the contextual relationships between contemporary media and ethics, history, drama, and art, as well as the mechanics of emerging information technologies. We feature small classes, a multidisciplinary faculty with real-world professional experience, high-technology laboratories, and an excellent location for media internships. This major prepares students for careers in areas such as public relations, journalism, graphic design, advertising, media production, and telecommunications. Because of our analytical approach, students can use the major to prepare for postgraduate studies.

For a B.Hum. degree in Communications, a minimum of 120 credits is required.

ENTRY TO MAJOR REQUIREMENTS: Entry to the Communications major requires a 2.00 or higher cumulative grade-point average.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 14 credits
(These elective credits may be applied to a Capital College minor in consultation with an academic adviser. The number of elective credits needed varies depending on whether the student participates in an internship.)

BACHELOR OF HUMANITIES DEGREE REQUIREMENTS: 18 credits
(See description of Bachelor of Humanities Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 43 credits
At least 12 credits of Communications courses must be taken at the 400 level.

PRESCRIBED COURSES (10 credits)[1]
COMMS 251(3), COMMS 371(4), COMMS 453(3) (Sem: 5-8)

ADDITIONAL COURSES (15 credits)
COMMS 230W(3) or COMMS 231W(3) (Sem: 3-8)
Select 12 credits[1] in Communications from the following: COMMS 221(3), COMMS 225(3), COMMS 374(3), COMMS 435(3), COMMS 437(3), COMMS 454(3), COMMS 460(3), COMMS 483(4), COMMS 495(1-6) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (18 credits)
Select 6 additional credits in Communications from the School of Humanities approved list (Sem: 5-8)
Select 12 credits from the School of Humanities approved list in consultation with an academic adviser. These credits may be applied to a Capital College minor in support of the student's interests (Sem: 5-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

COMMUNICATIONS

The Commonwealth College: Penn State Beaver, Delaware County, McKeesport, New Kensington

With the rapid development of digital technologies over the last decade, the field of communications has seen unprecedented growth and convergence of medium in media both technologically and structurally. The communications degree program addresses strongly articulated employer requirements for the workplace through an integrated program model. The degree provides the basic theoretical foundations of the discipline, allows for appropriate branching outside the traditional curriculum, and permits a drawing from appropriate courses in the disciplines of information sciences and technology, communications, arts and sciences, English and business.

The degree in communications provides two options for students who wish to develop their written and verbal skills in an effort to gain professional employment in fields such as public relations, publishing, speech writing, video and multimedia, production, and/or journalism.

CORPORATE COMMUNICATIONS OPTION: In extending traditional organizational communication and public relations to the digital age, this option prepares public relations specialists to compete in a global society. The program is also effective as preparation for e-commerce.

JOURNALISM OPTION: In today's workplace, journalism graduates are required to regularly engage rapidly converging media in their work. This option offers graduates a competitive advantage by complementing traditional options (newspaper, magazine, radio, TV) with convergent course work designed to prepare students for professional journalism in the digital age.

For a B.A. degree in Communications, a minimum of 121 credits is required.

GENERAL EDUCATION: 45 credits
(9-13 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 9-13 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits

REQUIREMENTS FOR THE MAJOR: 52 credits
(This includes 9-13 credits of General Education courses; 6 credits of GS courses; 3 credits of GH courses; 0-4 credits GQ courses)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 28 credits

PRESCRIBED COURSES: (16 credits)[1]
COMM 100 GS(3), IST 110(4) (Sem: 1-2)
COMM 260W(3) (Sem: 3-4)
COMM 494(3), COMM 495(3) (Sem: 7-8)

ADDITIONAL COURSES: (12 credits)
AM ST 105 GH;GI(3) or PHIL 103 GH(3) (Sem: 1-2)
PSY 002 GS(3) or SOC 001 GS(3) (Sem: 1-2)
ECON 002 GS(3) or ECON 004 GS(3) (Sem: 3-4)
CAS 201(3) or CAS 202(3) (Sem: 3-4)

REQUIREMENTS FOR THE OPTION: 24 credits

CORPORATE COMMUNICATIONS OPTION: (24 credits)

PRESCRIBED COURSES: (12 credits)
CAS 252(3) (Sem: 3-4)
COMM 370(3) (Sem: 5-6)
COMM 471(3), MKTG 310(3) (Sem: 7-8)

ADDITIONAL COURSES: (12-13 credits)
Some courses in this category have prerequisites that are not required in the program.
MKTG 221(3) or MKTG 221W(3) or MKTG 301(3) or MKTG 301W(3) (Sem: 5-6)
Select 9 credits from the following (at least 3 credits must be at the 400 level):
B A 100(3), B A 243(3), CAS 203 GS(3), CAS 214W(3), CAS 352(3), CAS 452W(3), CAS 404(3), CAS 471(3), COMM 270(3), COMM 283W(3), COMM 403(3), COMM 404(3), COMM 409(3), COMM 413(3),

COMM 473(3), ENGL 411(3), ENGL 419(3), ENGL 420(3), ENGL 421(3), CC 401(3), STAT 200 GQ(4) (Sem: 5-8)

JOURNALISM OPTION: (24 credits)

PRESCRIBED COURSES: (12 credits)
COMM 403(3), COMM 409(3), COMM 460W(3), ENGL 420(3) (Sem: 7-8)

ADDITIONAL COURSES: (12 credits)
Some courses in this category have prerequisites that are not required in the program.
Select 12 credits from the following: CAS 203(3), CAS 426W(3), COMM 205 GI(3), COMM 261(3), COMM 269(3), COMM 270(3), COMM 283W(3), COMM 401(3), COMM 413(3), COMM 461(3), COMM 470A(3), COMM 470B(3), COMM 470C(3), ENGL 210(3), ENGL 215(3), ENGL 411(3), ENGL 415(3), ENGL 416(3), ENGL 417(3) (Sem: 3-8)
[1]A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

COMPARATIVE LITERATURE

College of the Liberal Arts

Approaching with a global perspective, the major in Comparative Literature crosses the boundaries of geography, time, nationalities, languages, and cultures. The world of literature taught draws upon readings from the Americas, Europe, Africa, and Asia. The range includes recognized great books along with less-known works, texts that have received attention since ancient times and new texts by living writers, women's literature, myths and folktales, literary humor, African drama, Jewish fiction and poetry, Japanese and Chinese writing, works by Native Americans, and hero-tales such as the Arthurian legend. Students are challenged to appreciate different literatures, to learn about genres, themes, periods, and further concepts used in the critical analysis of literature, to situate literature within its cultural context, and to relate literature to other areas of creative experience, such as film. A senior seminar clarifies the mysteries of literary theory and provides opportunities for individual projects.

Students majoring in Comparative Literature take courses in the Department of Comparative Literature and in other literature departments. They also develop competence in a foreign language. Study abroad is encouraged: Students may count up to 18 Education Abroad credits toward the major.

Graduates of the Department of Comparative Literature have undertaken careers in teaching, completed advanced degrees in literature, librarianship, law, and similar fields, entered the Peace Corps or other types of government service, and pursued careers in writing and communications.

The department offers several minors (listed here) as well as the major in Comparative Literature.

For the B.A. degree in Comparative Literature, a minimum of 123 credits is required.

GENERAL EDUCATION: 45 credits
(6 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 24 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 36 credits[1]
(This includes 6 credits of GH General Education courses.)

PRESCRIBED COURSES (6 credits)
CMLIT 100 GH;GI(3) (Sem: 1-4)
CMLIT 400W(3) (Sem: 5-8)

ADDITIONAL COURSES (6 credits)
Select 6 credits in literary traditions from CMLIT 001 GH(3), CMLIT 002 GH;GI(3), CMLIT 003 GH;GI(3), CMLIT 004 GH;GI(3), CMLIT 005 GH;GI(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (24 credits)
(Must include at least 12 credits at the 400 level)
a. Select 6 credits in genre, period, theme courses from department list (Sem: 1-8)
b. Select 12 credits in literature from department list (6 credits in each of two departments) and/or in literature

language, or culture courses offered through an Education Abroad Program with departmental approval (Sem: 1-8)
c. Select 6 credits in foreign language beyond the 12th-credit level (Sem: 1-8)

Integrated B.A./M.A. Program in Comparative Literature

The Department of Comparative Literature offers an integrated B.A./M.A. program that is designed to allow academically superior baccalaureate students to obtain both the B.A. and the M.A. degrees in Comparative Literature within five years of study. The first two years of undergraduate course work include the University General Education and Liberal Arts requirements in addition to language and literature study in the major. In the third year, students are expected to define areas of interest in two primary literatures in different languages. In addition, students in the B.A./M.A. program should begin to undertake work in a second foreign language. The fourth year includes graduate-level work in methodology and the student's selection of primary literatures which replaces comparable 400-level senior year courses. The fifth and final year of the program typically consists of graduate work in Comparative Literature courses as well as the chosen literatures. The program culminates with an M.A. paper.

By encouraging greater depth and focus in the course of study beginning in the third undergraduate year, this program will help the student more clearly define his/her area of interest and expertise in the otherwise vast field of international literatures. As a result, long-range academic planning for exceptional students pursuing doctoral degrees after leaving Penn State, or other professional goals, will be greatly enhanced. The student may also be more competitive in applying for admission to Ph.D. programs as well as for institutional and national grant monies and scholarships.

ADMISSION REQUIREMENTS: The number of openings in the integrated B.A./M.A. program is limited. Admission will be selective based on specific criteria and the unqualified recommendation of faculty. Applicants to the integrated program: (1) Must be enrolled in the Comparative Literature B.A. program[1].
(2) Must have completed 60 credits of the undergraduate degree program (it is strongly suggested that students apply to the program prior to completing 100 credits). (3) Must be accepted without reservation into the M.A. program in Comparative Literature. (4) Should have a recommended overall GPA of 3.2 (on a 4.0 scale) in undergraduate course work and a minimum GPA of 3.5 in all course work completed for the major. (5) Must present a departmentally approved plan of study in the application process. (6) Must be recommended by the chairs of the Department's undergraduate and graduate committees.

For a typical sequences of course work, see **www.psu.edu/bulletins/bluebook**, click on the button for Liberal Arts, then the link for Majors and Minors, then link for this major.
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

COMPUTER ENGINEERING

College of Engineering

The mission of the faculty of the undergraduate Computer Engineering program at Penn State is to provide students with the knowledge and experience needed to pursue a productive lifelong career in industry or to engage in further study at the graduate level. Students participate in a balanced program of instruction covering the basic principles of the design and application of computer systems. The program includes coverage in breadth and depth of basic science, engineering, and abstract concepts of information handling. Students specialize in and are prepared for careers in the design, analysis and use of hardware, software, and systems. The program is structured to ensure that graduates have a clear understanding of the design and the applications of computers, as well as the ability to apply this knowledge throughout their professional careers.

Specifically, graduates shall be able to:
—Apply principles of computer engineering to the design, implementation, analysis, and evaluation of computer systems.
—Articulate engineering designs effectively in both oral and written formats to both technical and non-technical audiences.
—Use state-of-the-art tools, technologies, and software to solve problems in such diverse areas as operating systems, hardware design and synthesis, compiler design, modern programming languages, database technologies, architectural simulation, knowledge representation, image processing and computer vision.
—Work and think independently and participate in groups, including interdisciplinary groups, in an effective, professional and ethical manner.

For the B.S. degree in Computer Engineering, a minimum of 126 credits is required.

GENERAL EDUCATION: 45 credits
(21 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 102-103 credits
(This includes 21 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses; 3 credits of GWS courses.)

PRESCRIBED COURSES (74 credits)
CHEM 012 GN(3)[1], CHEM 014 GN(1), MATH 140 GQ(4), MATH 141 GQ(4)[1], PHYS 211 GN(4)[1], PHYS 212 GN(4) (Sem: 1-2)
CSE 120(3)[1], CSE 260(3)[1], CSE 271(3)[1], CSE 275(1), E E 210(4)[1], MATH 220 GQ(2), MATH 231(2), MATH 250(3), PHYS 214 GN(2) (Sem: 3-4)
CSE 331(3)[1], CSE 431(3)[1], CSE 465(3)[1], E E 310(4)[1], E E 317(3)[1], ENGL 202C GWS(3), STAT 418(3) (Sem: 5-6)
CSE 411(3), CSE 428(3), CSE 430W(3) (Sem: 7-8)

ADDITIONAL COURSES (22-23 credits)
Select 1 credit of First-Year Seminar (Sem: 1-2)
CMPSC 201C GQ(3)[1] or CSE 103 GQ(4)[1] (Sem: 1-2)
ECON 002 GS(3) or ECON 004 GS(3) (Sem: 3-4)
Select 9 credits from CSE 447(3), CSE 458(3), CSE 471(3), CSE 472(3), CSE 473(3), CSE 477(3), CSE 478(3), CSE 485(3), CSE 486(3), E E 453(3), E E 456(3) (Sem: 5-8)
Select 6 credits from any 400-level CSE course (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits from department list (Students may apply up to 6 credits of ROTC and 3 credits of Co-op.)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44. .

COMPUTER ENGINEERING

Penn State Erie, The Behrend College

This major provides students with a strong foundation in computer engineering through a combination of classroom study, design projects, and laboratory experience. Analysis and design of computer hardware and software systems are stressed. Built upon a core of science and mathematics courses, this major has the objective of educating graduates to be problem solvers. Students acquire the ability to work as members of a team toward successful attainment of a common goal, preparing them for industry or further study in graduate school. In addition, written and oral communication skills are developed from an early stage, culminating in a senior design project that stresses communication as well as engineering content.

In addition to completing a broad-based science core in mathematics, chemistry and physics, students pursue their interest in computer engineering by studying principles in digital hardware design, computer architecture, computer software, microelectronics, and computer data communications. The student will be required to analyze and solve a significant computer engineering design problem during the senior year.

ENTRANCE REQUIREMENT: In addition to the Carnegie unit and minimum GPA requirements described by University policies, all students applying for entrance to any of the engineering majors at Penn State Erie must have at least a 2.0 cumulative GPA by the end of the semester prior to applying for entrance to the major and have completed, with a minimum grade of C: CHEM 012 GN(3), MATH 140 GQ(4), MATH 141 GQ(4), and PHYSICS 211 GN(4). These courses must be completed by the end of the semester during which the admission to major process is carried out.

For the B.S. degree in computer engineering, a minimum of 130 credits is required. Each student must earn at least a grade of C in each 300- and 400-level course in the major field.

Students must take E E 210(4), EE BD 324(4), EE BD 421(3); CMPSC 201C GQ(3) or CMPSC 201F GQ(3); CSE 271(3) and CSE 275(1) or EE BD 325(4); select 6 credits from CENBD 431(3), CENBD 451W(3), CENBD 453(3), CENBD 455(3), CENBD 461(3), CENBD 463(3), CENBD 465(3), CENBD 467(3), or EE BD 422(3), for a total of 24 credits (at least 6 credits must be at the 400 level). Students must receive a grade of C or better in all courses required for the minor.

GENERAL EDUCATION: 45 credits
(21 of the 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 1 credit

REQUIREMENTS FOR THE MAJOR: 105 credits
(This includes 21 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GWS courses; 3 credits of GS courses)

PRESCRIBED COURSES (93 credits)
CHEM 012 GN(3)[1], CHEM 014 GN(1)[1] (Sem: 1-2)
CSE 103 GQ(4), CSE 120(3)[1], CSE 260(3), CSE 271(3)[1], CSE 275(1)[1], E E 210(4)[1], ENGL 202C GWS(3), MATH 140 GQ(4)[1], MATH 141 GQ(4)[1], MATH 220 GQ(2)[1], MATH 230(4)[1], MATH 250(3)[1], PHYS 211 GN(4)[1], PHYS 212 GN(4), PHYS 214 GN(2) (Sem: 1-4)
CENBD 431(3), CENBD 451W(3), CENBD 452(3), CENBD 453(3), CMPBD 410(3), EE BD 324(4), EE BD 326(4), EE BD 421(3), STABD 303(3) (Sem: 5-6)
CENBD 455(3), CENBD 463(3), CENBD 480(3), CENBD 481(3) (Sem: 7-8)

ADDITIONAL COURSES (3 credits)
ECON 002 GS(3) or ECON 004 GS(3) (Sem: 1-6)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 9 credits of technical elective courses from school-approved list. (Sem: 7-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-4.

COMPUTER SCIENCE

Capital College

This program is designed to prepare students for employment as computer scientists in engineering, scientific, industrial, and business environments as software developers, programmers, and systems analysts. While most students will enter the job market directly upon graduation, graduate school in computer science or related areas is also an option. Selection of electives can be tailored for students pursuing this path.

The Computer Science major provides a solid foundation in the areas of systems programming, algorithm design, artificial intelligence, and engineering large software systems using state-of-the-art methodologies and programming languages.

Students may expect to: develop a solid foundation in mathematical studies relevant to computer science; master skills in computer science; enjoy possibilities for internships and part-time employment with local companies; and become problem solvers. These goals are consistent with the goals outlined by the Association of Computing Machinery.

For a B.S. degree in Computer Science, a minimum of 120 credits is required.

ENTRY TO MAJOR REQUIREMENTS: Entry to the Computer Science major requires that the student has completed: MATH 140 GQ(4), MATH 141 GQ(4), CMPSC 201(3) or CSE 103(4). A 2.00 or higher cumulative grade-point average is required.

GENERAL EDUCATION: 45 credits
(9 of these 45 credits are included in the Requirements for the Major.)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 5-6 credits

REQUIREMENTS FOR THE MAJOR: 78-79 credits
(This includes 9 credits of General Education courses: 3 credits of GWS courses, 6 credits of GQ courses.)

PRESCRIBED COURSES (51 credits)
MATH 140 GQ(4)[2], MATH 141 GQ(4)[2](Sem: 1-2)
ENGL 202C GWS(3) (Sem: 3-4)
MATH 017 GQ(3)[2] (Sem: 3-4)
SSET 295(1) (Sem: 4)
COMP 401(3), COMP 402(3)[1], COMP 404(3)[1], COMP 410(3)[1], COMP 411(3)[1], COMP 412(3), COMP 413W(3), COMP 416(3), COMP 432(3) (Sem: 5-8)
MA SC 370(3)[1], MA SC 420(3), MA SC 460(3) (Sem: 5-8)

ADDITIONAL COURSES (9-10 credits)
Select 3-4 credits[2] from the following: CMPSC 201C GQ(3) or CSE 103 GQ(4) (Sem: 3-4)
Select 6 credits[2] from the following: CSE 120 GQ(3), CSE 260(3), CSE 271(3) (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (18 credits)
Select 12 credits from the following: COMP 403(3), COMP 406(3), COMP 408(3), COMP 409(3), COMP 414(3), COMP 418(3), COMP 419(3), COMP 420(3), COMP 421(3), COMP 430(3), COMP 435(3), COMP 497(1-9), MA SC 421(3), MA SC 425(3), MA SC 440(3), MA SC 441(4), MA SC 461(3), MA SC 475W DF(3), MA SC 477(3) (Sem: 5-8)

Select 6 credits of 300-400 level courses in consultation with an academic adviser and in support of the student's interests. (Sem. 5-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
[2] Cumulative GPA of 2.40 required for these courses.

COMPUTER SCIENCE

College of Engineering

Computer Science is concerned with the analysis, design, and applications of computing software and systems. It includes a core foundation in computer hardware and software with emphasis on the design of efficient, fault-free software. It includes programming languages, data structures, compilers, operating systems, data bases, and artificial intelligence.

The major is designed to provide fundamental training in preparing graduates for positions in schools, commerce, industry, and government. Students should consult their advisers in formulating suitable programs.

For the B.S. degree in Computer Science, a minimum of 124 credits is required.

GENERAL EDUCATION: 45 credits
(15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 94-95 credits
(This includes 15 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses.)

PRESCRIBED COURSES (56 credits)
PHYS 211 GN(4)[1], PHYS 212 GN(4) (Sem: 1-2)
CSE 103 GQ(4)[1], CSE 120(3)[1], CSE 260(3)[1], MATH 140 GQ(4)[1], MATH 141 GQ(4)[1], MATH 220 GQ(2) (Sem: 1-4)
CSE 271(3)[1], CSE 331(3)[1], MATH 230(4) (Sem: 3-4)
STAT 318(3), STAT 319(3) (Sem: 3-6)
CSE 411(3)[1], CSE 428(3)[1], CSE 431(3)[1], CSE 465(3)[1] (Sem: 5-6)

ADDITIONAL COURSES (13 credits)
Select 1 credit of First-Year Seminar (Sem: 1-2)
Select 6 credits from CSE 418(3), CSE 421(3), CSE 451(3), CSE 455(3), CSE 456(3), CSE 457(3), CSE 458(3), CSE 460(3), CSE 467(3), CSE 468(3), CSE 481(3), CSE 486(3), E E 456(3) (Sem: 7-8)
Select 3 credits from any 400-level CSE course (Sem: 7-8)
Select 3 credits from CSE 420W(3) or CSE 441W(3) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (25-26 credits)
Select 2-3 credits from PHYS 213 GN(2), PHYS 214 GN(2), or 3 credits from the approved list of natural sciences courses (Sem: 3-4)
Select 0-4 credits in a foreign language (second-semester proficiency) (Sem: 5-6)
Select 13-17 credits from department list (Students may apply 6 credits of ROTC and 6 credits for Co-Op.) (Sem: 7-8)
Select 6 credits in 400-level non-CSE courses in consultation with adviser (Sem: 7-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

COMPUTER SCIENCE

Penn State Erie, The Behrend College

This major builds on a firm foundation of computer science, mathematics, and natural science courses. Students prepare for the major by taking lower-division courses in programming, discrete math, and computer organization. They then complete upper-division courses in data structures, data base management systems, programming language fundamentals, graphics and visualization, and systems programming. Students must complete an 8-credit physics sequence, four credits in biology or chemistry, and an additional 10 credits in a combination of natural science, math, or statistics electives. Finally, they must take at least 9 credits of computer science electives and 9 credits of supporting courses.

Graduates of this program will be prepared for a wide variety of computer-oriented careers in business, industry, and government, particularly in areas that require the practical application of computer science concepts and techniques to solving problems in the natural sciences. In addition, graduates will be prepared to pursue graduate study in computer science or in computationally intensive subdisciplines of the natural sciences,

such as bioinformatics, computational biology, computational physics, or computational chemistry.

For a B.S. degree in Computer Science, a minimum of 124 credits is required. A student enrolled in this major must earn at least a grade of C in each 300- and 400-level course in the major field.

GENERAL EDUCATION: 45 credits
(18 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 1 credit

REQUIREMENTS FOR THE MAJOR: 96-98 credits
(This includes 18 credits of General Education courses: 6 credits of GQ courses, 3 credits of GWS courses, 9 credits of GN courses.)

PRESCRIBED COURSES (59 credits)
MATH 140 GQ(4)[1], MATH 141 GQ(4)[1], CSE 103 GQ(4)[1], CSE 120(3)[1], CMPBD 127(1)[1] (Sem: 1-2)
CSE 260(3), CSE 271(3), CMPBD 360(3)[1], MATH 220 GQ(2), MATH 250(3), PHYS 211 GN(4), PHYS 212 GN(4),
ENGL 202C GWS(3) (Sem: 3-4)
STABD 303(3)[1], CMPBD 410(3)[1], CMPBD 460W(3)[1], CENBD 421(3)[1] (Sem: 5-6)
CMPBD 411(3)[1], CMPBD 440(3)[1] (Sem: 7-8)

ADDITIONAL COURSES (9-11 credits)
Select either BIOL 110 GN(4), or CHEM 012 GN(3) and CHEM 014 GN(l) (Sem: 1-2)
M I S 204(2) or IST 110(4) (Sem: 3-4)
MISBD 336(3)[1] or IST 210(3) (Sem: 5-6)

SUPPORTING COURSES AND RELATED AREAS (28 credits)
Select 10 additional credits in the sciences from the approved list (Sem: 1-8)
Select 9 credits from the school approved list [Students may apply 6 credits of ROTC] (Sem: 3-8)
Select 9 additional credits in computing from the approved list (Sem: 5-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

CORPORATE COMMUNICATION

Abington College

Building on the interdisciplinary strengths of Penn State Abington, the Corporate Communications B.A. program prepares students for public information and media relations positions in profit and nonprofit organizations. The program is distinguished by its cross-disciplinary course work in business, information systems, human behavior, and oral, written, and visual conununication. In addition, there is a required field experience. The B.A. provides a broad foundation in business principles, including team projects and problem solving; ethics; oral, written and visual communication skills; and psychology. The major is designed to prepare students for a variety of career fields including human resources, public relations, training and development, and public information.

For the B. A. degree in Corporate Communication, a minimum of 122 credits is required.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION courses)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 0-13 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 12-24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin)

REQUIREMENTS FOR THE MAJOR: 49-50 credits[1]

PRESCRIBED COURSES (31 credits)
IST 110(4), ACCTG 211(4), M I S 204(2) (Sem: 1-2)
COMM 100 GS(3) (Sem: 1-4)
IST 250(3), MKTG 301(3), MGMT 301(3) (Sem: 3-4)
MKTG 310(3) (Sem: 5-6)
CC 403W(3), CC 495A(3) (Sem: 7-8)

ADDITIONAL COURSES (18-19 credits)
B A 243(4) or PHIL 103 GH(3) (Sem: 1-4)
MGMT 321(3) or PSY 217 GS(3) (Sem: 3-6)
CAS 252(3) or CAS 352(3), ENGL 417(3) or ENGL 419(3), PSY 475(3) or MGMT 424(3), CC 401(3) or CC 402(3) (Sem: 5-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

CREATIVE WRITING

Penn State Erie, The Behrend College
The major will allow students to develop their writing skills through craft classes, literature classes, and writing workshops, in preparation for a variety of post-graduation options, from continuing on to M.F.A. degree programs to various positions in the publishing or editing fields. The program recognizes students must understand the relationship between tradition and individual talent, and provides a required sequence of literature courses designed to give students an overview of the historical literary traditions as well as the traditions of both modern and contemporary prose and poetry, options for additional literature courses (to broaden and/or deepen the nature of that relationship), and a course in creative writing theory. The program also includes a course which has students attending readings by Visiting Writers, and provides further professional development in a variety of ways. The program culminates in a capstone experience, the senior thesis, a collection of poetry or prose of publishable quality, with a critical preface to the collection demonstrating the students' ability to discuss the nature of their own writing and to place it in a literary context.

For the B.F.A. degree in Creative Writing, a minimum of 125 credits is required. A student enrolled in this major must earn at least a grade of C in each 300- and 400-level course.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 80 credits

PRESCRIBED COURSES (46 credits)

ENGL 200(3)[1], ENGL 212(3)[1], ENGL 213(3)[1], ENGL 215(3)[1] (Sem: 1-4)
ELISH 300(3)[1], ELISH 301(3)[1], ELISH 442(3)[1], ELISH 448(3)[1], ENGL 458(3)[1] (sem: 4-6)
ELISH 001(1)*, ELISH 484W(3)[1], ELISH 488(3)[1], ENGL 437(3)[1] (sem: 5-8)
ELISH 494A(6)[1] (sem: 7-8)
*A student is required to take this course a minimum of four times.

ADDITIONAL COURSES (25 credits)
Select 1 credit of First-Year Seminar (Sem: 1-2)
Foreign Language Requirement (proficiency of 12 credits of course work or equivalent)
Select 6 credits from the following courses: ENGL 262 GH(3), ENGL 263 GH(3), ENGL 265 GH(3) (Sem: 3-6)
Select 6 credits from one of the following:
ENGL 415(3)[1] and ENGL 425(3)[1] (Sem: 4-8)
ELISH 426(3)[1] and ELISH 429W(3)[1] (Sem: 4-8)
ELISH 427(3)[1] and ELISH 430(3)[1] (Sem: 4-8)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 3 credits from The Canon and Its Critics (Sem: 3-6)
Select 3 credits from Globality and Literature (Sem: 3-6)
Select 3 credits from Cultural Studies (Sem: 3-6)
In addition to the requirements above, for enrichment, students in the B.F.A. degree program have the opportunity of taking ELISH 002, Literary Magazine Practicum, and serving as genre editors or assistant editors on the staff of *Lake Effect*, the national literary journal published by the School of Humanities and Social Sciences at Penn State Erie, The Behrend College. This is a 1-credit course in which students may enroll for up to 8 credits over their time in the degree program.
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

CRIME, LAW, AND JUSTICE, B.A.

College of the Liberal Arts
(The Bachelor of Arts degree in Crime, Law, and Justice is offered by the Crime, Law, and Justice Program in the Department of Sociology.)
This major provides students with a broadly based liberal education focused on the understanding and analysis of crime and justice systems. Students obtain a foundation of knowledge of the basic components of the criminal justice and legal systems as well as abilities to solve problems, think and read critically, and write effectively within the context of criminal justice and criminological research and theory.

The B.A. degree is suitable for students seeking entry level positions in the criminal justice system and for students interested in graduate and law school. Students interested in acquiring strong quantitative skills should consider the B.S. degree.

For the B.A. degree in Crime, Law and, Justice, a minimum of 121 credits is required.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

GENERAL EDUCATION: 45 credits
(4 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 21 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 35 credits[1]
(This includes 4 credits of General Education GQ courses.)

PRESCRIBED COURSES (17 credits)
CLJ 111(3)/ADM J 111(3), CLJ 012 GS(3)/ADM J 012 GS(3)/SOC 012 GS(3), CLJ 113(3)/ADM J 113(3) (Sem: 1-4)
STAT 200 GQ(4) (Sem: 1-8)
ADM J 240W(4) (Sem: 2-4)

ADDITIONAL COURSES (18 credits)
Select 3 credits from: CAS 283(3), CMPSC 100(3), CMPSC 101 GQ(3) (Sem: 1-8)
Select 3 credits from: ADM J 451 GI(3), ADM J 453 GI(3)/WMNST 453 GI(3) (Sem: 5-8)
Select 6 credits from the core courses: ADM J 230(3), CLJ 432(3), CLJ 435(3), ADM J 441(3), CLJ 467(3)/ADM J 467(3)/SOC 467(3) (Sem: 5-8)
Select 6 additional credits at the 400 level in Crime, Law, and Justice (Sem: 5-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

CRIME, LAW, AND JUSTICE, B.S.

College of the Liberal Arts
This major provides the opportunity to develop a stronger foundation in research methods, quantification, and the sciences. It prepares students with relevant aptitudes for pursuing further studies or finding employment where such knowledge is advantageous. Students contemplating futures in social science research, business, forensics, public service, and paralegal positions should consider this degree or some of its recommended courses.

Either the B.A. or B.S. degree is suitable for students seeking entry level positions in the criminal justice system and for students interested in graduate and law school. Students interested in acquiring strong quantitative skills should consider the B.S. degree.

For the B.S. degree in Crime, Law, and Justice, a minimum of 121 credits is required.

GENERAL EDUCATION: 45 credits
(4 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 16-18 credits

REQUIREMENTS FOR THE MAJOR: 62-64 credits[1]
(This includes 4 credits of GENERAL EDUCATION GQ courses)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 41 credits

PRESCRIBED COURSES (17 credits)
CLJ 111(3)/ADM J 111(3), CLJ 012 GS(3)/ADM J 012 GS(3)/SOC 012 GS(3), CLJ 113(3)/ADM J 113(3) (Sem: 1-2)
STAT 200 GQ(4) (Sem: 1-8)
ADM J 240W(4) (Sem: 2-4)

ADDITIONAL COURSES (24 credits)
Select 3 credits from: CAS 283(3), CMPSC 100(3), CMPSC 101 GQ(3) (Sem: 1-8)
Select 6 credits in race, ethnicity and gender:
AAA S 100 GS;GI(3), AAA S 101 GH;GI(3), AAA S 103 GI(3)/SOC 103 GI(3)/WMNST 103 GI(3), ADM J 453 GI(3)/WMNST 453 GI(3), AM ST 104 GH;GI(3)/WMNST 104 GH;GI(3), AM ST 105 GH;GI(3), AM ST 405(3), ANTH 146 GS;GI(3), CAS 271GI(3), CAS 422 GI(3), CAS 455 GI(3), CAS 471 GI(3), CLJ 451(3), CMLIT 101 GH;GI(3), ENGL 135 GH;GI(3), ENGL 139 GH;GI(3), ENGL 462 GI(3), HIST 154 GH;GI(3), L I R 136 GI(3)/WMNST 136 GI(3), PHIL 009 GH;GI(3), PSY 472 GI(3), SOC 119 GS;GI(4), SOC 409 GI(3), SOC 419(3), SOC 429(3) or WMNST 001 GS;GI(3) (Sem: 1-8)
Select 6 credits from the core courses ADM J 230(3), ADM J 441(3), CLJ 432(3), CLJ 435(3), CLJ 467(3)/SOC 467(3) (Sem: 5-8)
Select 3 credits from ADM J 451 GI(3), ADM J 453 GI(3)/WMNST 453 GI(3) (Sem: 5-8)
Select 6 additional credits at the 400-level in Crime, Law, and Justice (CLJ) (Sem: 5-8)

REQUIREMENTS FOR THE OPTION: 21-23 credits

BUSINESS OPTION: 21 credits

PRESCRIBED COURSES (6 credits)
ECON 002 GS(3), ECON 004 GS(3) (Sem: 1-8)

ADDITIONAL COURSES (15 credits)
Select 15 credits with at least 3 credits each from groups a, b, c, d (Sem: 3-8)
a) ECON 302 GS(3), FIN 100(3)
b) MGMT 100(3), MKTG 221(3), PSY 231 GS(3), PSY 441(3), PSY 451(3), PSY 461(3)
c) B LAW 243(3), L I R 401(3), L I R 411(3), L I R 434(3), L I R 435(3), L I R 437(3), SOC 444(3), SOC 455(3)
d) Select 3 credits from CAS 404(3), CAS 450W(3), CAS 452(3), CAS 471 GI(3), CAS 483(3), ENGL 418(3), ENGL 419(3), ENGL 421(3), FR 408(3), GER 408(3), HIST 425(3), HIST 458W(3), L I R 400-level course(s), PL SC 412(3), PL SC 417(3), PL SC 419(3), PL SC 420(3), PL SC 444(3), PSY 441(3), PSY 451(3), PSY 461(3), SOC 444(3), SOC 455(3), SOC 456(3), SPAN 412(3)

COMPUTING AND STATISTICS OPTION: 21 credits

PRESCRIBED COURSES (5 credits)
SOC 470(4), STAT 480(1) (Sem: 5-8)

ADDITIONAL COURSES (16 credits)
Select 16 credits from CAS 483(3), CMPSC 203 GQ(4), M I S 204(2); MATH 110 GQ(4) and MATH 111 GQ(2) or MATH 140 GQ(4) and MATH 141 GQ(4); STAT 460(3), STAT 462(3) or STAT 464(3) (Sem: 1-8)

LEGAL STUDIES OPTION: 21 credits

PRESCRIBED COURSES (3 credits)
PHIL 012 GQ(3) (Sem: 1-8)

ADDITIONAL COURSES (18 credits)
Select 3 credits from CAS 213(3), CAS 215(3), CAS 321(3) or CAS 250(3) (Sem: 3-8)
Select 12 credits from B LAW 243(3), B LAW 410(3), CLJ 432(3) or CLJ 467(3)/SOC 467(3), CLJ 469(3), COMM 403(3), L ST 470(3), PHIL 105 GH(3), PHIL 108 GH(3), PHIL 408(3), PL SC 403(3), PL SC 431(3), PL SC 432(3), PL SC 471(3), PL SC 472(3), SOC 405(3) (Sem: 5-8)
Select 3 credits from HIST 449(3), HIST 450(3), PL SC 473(3), PL SC 474(3), PL SC 475(3) (Sem: 5-8)

PRE-FORENSICS OPTION: 21-23 credits

ADDITIONAL COURSES (21-23 credits)
Select 6-8 credits from MATH 110 GQ(4) and MATH 111 GQ(2) or MATH 140 GQ(4) and MATH 141 GQ(4) (Sem: 1-8)
Select 15 credits from BIOL 011 GN(3) and BIOL 012 GN(1), BIOL 110 GN(4), BIOL 230W GH(4), CHEM 012 GN(3) and CHEM 014 GN(1) or CHEM 013 GN(3) and CHEM 015 GN(1), CHEM 034(3) and CHEM 035(3) or CHEM 036(2), CHEM 038(3) and CHEM 039(3), ENT 402(3), ENT 412(3), PHYS 250 GN(4) (Sem: 1-8)

SOCIAL SCIENCE RESEARCH OPTION: 22-23 credits

PRESCRIBED COURSES (5 credits)
SOC 470(4), STAT 480(1) (Sem: 5-8)

ADDITIONAL COURSES (17-18 credits)
Select 8-9 credits from MATH 110 GQ(4) and MATH 111 GQ(2) or MATH 140 GQ(4) and MATH 141 GQ(4), STAT 460(3), STAT 462(3), STAT 464(3) (Sem: 1-8)
Select 9 credits from HD FS 401(3), PL SC 420(3), PSY 419(3), any 400-level STAT course (Sem: 5-8)

NOTE: Internships will be counted as elective credits (CLJ 395).
NOTE: The following themes should be incorporated into all CLJ classes, as appropriate: ethical issues, ethnicity and gender issues, and theory.
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

CRIMINAL JUSTICE, B.A.

Altoona College
Students receiving a baccalaureate degree in criminal justice should understand each of the three main components of the criminal justice system and their interrelationships, be able to evaluate critically both current and future crime control policy proposals and criminal justice research, and understand the complexity of the crime phenomenon and its relationship to individual, social, and cultural factors. This major includes study in law enforcement, courts and corrections individually and as components of a system, plus work in theories of crime causation, and crime control policy. Students should expect reading, writing, and critical thinking skills to be rigorously applied and developed throughout the degree program. The Bachelor of Arts degree in Criminal Justice provides a broadly based liberal arts background for the study of crime, justice and the criminal justice system. The Bachelor of Science degree offers an opportunity for educational enrichment in fields not traditionally considered part of the liberal arts. Either degree is excellent preparation for a career in criminal justice, graduate, or professional study, or informed citizenship.

For the B.A. degree in Criminal Justice, a minimum of 128 credits is required.

GENERAL EDUCATION: 45 credits
(9-13 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 21-25 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits

REQUIREMENTS FOR THE MAJOR: 47 credits[1]
(This includes 9-13 credits of General Education courses: 3 credits of GH courses; 0-4 credits of GQ courses; 6 credits of GS courses.)

PRESCRIBED COURSES (34 credits)
CJ 100(3), M I S 103(3), PHIL 103 GH(3), SOC 007(3), SOC 012 GS(3), SOC 119 GS;GI(4) (Sem: 1-4)
CJ 210(3), CJ 220(3), CJ 230(3) (Sem: 3-6)
CJ 450W(3), CJ 495(3) (Sem: 7-8)

ADDITIONAL COURSES (13 credits)
MS&IS 200(4) or STAT 200 GQ(4) (Sem: 1-4)
Select 9 credits from CJ 420(3), CJ 430(3), CJ 460(3), or any other 400-level CJ course (except CJ 495) (Sem: 1-4)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

CRIMINAL JUSTICE, B.S.

Altoona College
For the B.S. degree in Criminal Justice, a minimum of 128 credits is required.

GENERAL EDUCATION: 45 credits
(9-13 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 33-37 credits

REQUIREMENTS FOR THE MAJOR: 59 credits[1]
(This includes 9-13 credits of General Education courses: 3 credits of GH courses; 0-4 credits of GQ courses; 6 credits of GS courses.)

PRESCRIBED COURSES (34 credits)
CJ 100(3), M I S 103(3), PHIL 103 GH(3), SOC 007(3), SOC 012 GS(3), SOC 119 GS;GI(4) (Sem: 1-4)
CJ 210(3), CJ 220(3), CJ 230(3) (Sem: 3-6)
CJ 450W(3), CJ 495(3) (Sem: 5-8)

ADDITIONAL COURSES (13 credits)
MS&IS 200(4) or STAT 200 GQ(4) (Sem: 1-4)
Select 9 credits from CJ 420(3), CJ 430(3), CJ 460(3), or any other 400-level CJ Course (except CJ 495) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 12 credits, in consultation with the adviser, in one or two of the following skill enhancement areas: accounting, computers, composition and rhetoric, counseling, education, law and legal studies, foreign language, management, public speaking, research methods and statistics, science and engineering, biobehavioral health; or in the following topics: adolescence, deviant behavior, drugs, minorities (Sem: 3-6)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

CRIMINAL JUSTICE

Capital College
The Bachelor of Science degree program in Criminal Justice helps provide its graduates with the communications and analytical skills critical to succeed in criminal justice and related careers. Through an interdisciplinary approach to the problems of crime and society, the program also equips students to pursue graduate study in criminal justice or related disciplines, and educates students to become effective problem-solvers as professionals in the field of criminal justice.

The study of criminal justice is approached as an applied interdisciplinary science, teaching students both the theoretical and the practical aspects of crime control and the administration of justice. The Criminal Justice program at Harrisburg is designed for students who have completed at least 60 credits from other institutions or who hold an associate degree in Criminal Justice or Police Science. The Criminal Justice program at Schuylkill provides all four years of the Criminal Justice degree.

The Criminal Justice curriculum provides students with the opportunity and assistance to acquire knowledge of the roles of policing, courts, laws, and corrections as they relate to both the adult and juvenile justice system. Students also gain knowledge of the history, concepts, and critical issues related to the role of gender and race/ethnicity in the criminal justice system, victimology, and ethics in criminal justice. The curriculum further provides a theoretical foundation of the discipline, combined with a thorough understanding of the scientific method as it applies to criminal justice. This combination is expected to sharpen the students' talents of reasoning and judgment, qualities imperative to rational functioning in criminal justice and related professions.

For a B.S. degree in Criminal Justice, a minimum of 120 credits is required.

ADMISSION REQUIREMENTS FOR TRANSFER STUDENTS: Transfer applicants must have at least a 2.0 cumulative grade-point average (4.0 scale). The evaluation of prior college work is conducted on an individual basis by the Office of Enrollment Services at both campuses.

ENTRY TO MAJOR REQUIREMENTS: The student must have a 2.00 cumulative grade-point average and an average of C (2.00) or better in any course already taken in the major.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 11 credits

REQUIREMENTS FOR THE MAJOR: 64 credits

PRESCRIBED COURSES (31 credits)[1]
CRIMJ 200 GS(3), CRIMJ 201 GI(3), CRIMJ 202 DF(3), CRIMJ 203(3), CRIMJ 241(3), CRIMJ 305(3), CRIMJ 388(3), CRIMJ 450W(3), CRIMJ 490W(3), SCLSC 320(4) (Sem: 5-8)

ADDITIONAL COURSES (15 credits) (At least 6 credits in Additional Courses and/or Supporting Courses must be at the 400 level.)
Select 12 credits from the following: BE SC 408(3), BE SC 461(3), CRIMJ 303 DF(3), CRIMJ 304(3), CRIMJ 389(3), CRIMJ 401 DF(3), CRIMJ 403 GI(3), CRIMJ 404(3), CRIMJ 406 DF(3), CRIMJ 407 GI(3), CRIMJ 408 DF(3), CRIMJ 410(3), CRIMJ 411(3), CRIMJ 430(3), CRIMJ 436 GI(3), CRIMJ 489W(3), CRIMJ 495(3-12), CRIMJ 496(1-18), CRIMJ 497(1-9), PL SC 002(3), PL SC 003 GS(3), PL SC 014 GS(3), PL SC 456(3), PSYC 406(3), PUBPL 304W(3), PUBPL 400(3), PUBPL 401(3), PUBPL 420(3), PUBPL 480(3), SOCIO 372(3), SOCIO 463(3), SOCIO 484(3), SOCIO 486(3) (Sem: 5-8)
Select 3 credits from the following: PL SC 001 GS(3), PL SC 003 GS(3), PL SC 014 GS(3), PL SC 403(3), PL SC 408(3), PL SC 409(3), PL SC 456(3), PL SC 496(1-18), PL SC 497(1-9), PUBPL 397(1-9), PUBPL 400(3), PUBPL 410 GI(3), PUBPL 411 DF(3), PUBPL 412 GI(3), PUBPL 413 GI(3), PUBPL 421 DF(3), PUBPL 485(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (18 credits)
Select 6 credits at the 300 and 400 level from the following: AFRAS, BE SC, PSYC, SOCIO (Sem: 5-8)
Select 12 credits in consultation with an academic adviser and in support of the student's interests. For information about specific courses in this area, contact the School of Public Affairs. (Sem: 5-8)
[1]A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

EARTH SCIENCES

College of Earth and Mineral Sciences
This major provides a comprehensive program in environmental sciences based on a strong emphasis in earth sciences. It is especially directed toward study of the problems that arise from the complex interaction of man's technological and social activities with the natural environment. Graduates are in demand for positions in government, industry, and consulting. Professional activities include gathering and evaluating data on environments; management and coordination of specialized programs in environmental control and modification; and industrial and government planning. Suitable choices of courses may qualify students for graduate work in several fields.

For the B.S. degree in Earth Sciences, a minimum of 123 credits is required.

GENERAL EDUCATION: 45 credits
(21 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 99-101 credits
(This includes 21 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 6 credits of GWS courses.)

PRESCRIBED COURSES (31 credits)
CHEM 012 GN(3), CHEM 013 GN(3), CHEM 014 GN(1), CHEM 015 GN(1), EM SC 100S GWS(3)[71], MATH 140 GQ(4), MATH 141 GQ(4) (Sem: 1-2)
PHYS 211 GN(4), PHYS 212 GN(4) (Sem: 1-4)
BIOL 110(4) (Sem: 3-4)

ADDITIONAL COURSES (36 credits)
ENGL 015 GWS(3) or ENGL 030 GWS(3) (Sem: 1-2)
Select 15 credits of introductory earth science from the following list (courses may not double count with minor requirements): EARTH 002 GN(3), EARTH 101 GN(3), EARTH 103 GN(3), EARTH 105 GN(3), METEO 003

GN(3), METEO 022(2), GEOG 030 GS(3), GEOG 105(3), GEOG 110 GN(3), GEOG 115 GN(3), GEOG 121(3), GEOSC 001(3), GEOSC 021 GN(3), SOILS 101 GN(3) (Sem: 1-6)
Select 15 credits[1] of advanced earth science from the following list (courses may not double count with minor requirements): GEOG 406(3), GEOG 408W(3), GEOG 432W(3), GEOSC 204(4), GEOSC 320(3), GEOSC 340(3), GEOSC 402W(3), GEOSC 416(3), METEO 300(3), METEO 431(3), METEO 475(3) (Sem: 3-8)
Select 3 credits of writing-intensive courses from within Earth and Mineral Sciences to include, but not limited to: GEOG 432W(3), GEOG 433W(3), GEOSC 402W(3), GEOSC 470W(3), METEO 471W(3) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (32-34 credits)
Select 3-4 credits of advanced math, statistics, computer science in consultation with an adviser (Sem: 5-8)
Select 3 credits of field, laboratory experience in consultation with an adviser (Sem: 5-8)
Select 8-9 credits in other approved courses (Students may apply 6 credits of ROTC) (Sem: 5-8)
Select 18 credits[1], in consultation from an adviser, from one of the following Earth and Mineral Sciences interdisciplinary minors: Climatology; Marine Science; Watersheds and Water Resources; Earth Systems; Global Business Strategies for Earth and Environmental Industries.
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
[71] The following substitutions are allowed for students attending campuses where the indicated course is not offered: CAS 100 GWS or ENGL 202C GWS can be substituted for EM SC 100S GWS.

EAST ASIAN STUDIES

College of the Liberal Arts
This is an interdisciplinary major, with a strong disciplinary core, for students who want a basic understanding of the background and contemporary aspect of China, Japan, and Korea.
For the B.A. degree in East Asian Studies, a minimum of 124 credits is required.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 25 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 30 credits[1]

ADDITIONAL COURSES (30 credits)
Select 3 credits beyond the 12-credit level of proficiency in an East Asian language:
CHNS 110(3), JAPNS 110(3), or the equivalent (Sem: 3-6)
Select 9 credits with 3 credits from each of the categories a, b, and c (credit received for a specific course will not count in more than one category):
a. HIST 174 GH;GI(3) or HIST 175 GH;GI(3) (Sem: 1-4)
b. RL ST 003 GH;GI(3), RL ST 104 GH;GI(3), or RL ST 181 DF(3) (Sem: 1-4)
c. CMLIT 004 GH;GI(3) or PHIL 007 GH;DF(3) (Sem: 1-4)
Select 18 credits from the following, at least 12 credits of which are to be at the 400 level; independent study credits selected in consultation with adviser; additional further credits in language studies may be permitted up to 6 credits (credit received for a specific course will not count in more than one category): ART H 120 GA;GI(3), ART H 320 GA;GI(3), CHNS 401(3), CHNS 402(3), CHNS 496(1-18), CMLIT 004 GH;GI(3), CMLIT 404(3), EA ST 401(3-6), ECON 474(3), GEOG 443(3), HIST 172 GI(3), HIST 174 GH;GI(3), HIST 175 GH;GI(3), HIST 480(3), HIST 481 DF(3), HIST 483(3), HIST 485W(3), HIST 486(3), JAPNS 401(3), JAPNS 402(3), JAPNS 496(1-18), PHIL 007 GH;DF(3), PL SC 145 DF(3), PL SC 458(3-6), PL SC 468(3), RL ST 003 GH;GI(3), RL ST 104 GH;GI(3), RL ST 181 DF(3), RL ST 409 DF(3), RL ST 481 DF(3), RL ST 483 DF(3), THEA 406 DF(3) (Sem: 1-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

ECONOMICS

Smeal College of Business
This major is designed for those who seek a broad understanding of the operation of the economic system and training in the methods and uses of economic analysis. Graduates are equipped for employment in many areas of business operations, labor unions, and agencies of government at all levels, and to undertake the graduate work necessary to become professional economists.

An honors program is also offered.
For the B.S. degree in Economics, a minimum of 120 credits is required.

GENERAL EDUCATION: 45 credits
(15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selections)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 12-14 credits

REQUIREMENTS FOR THE MAJOR: 76-78 credits
(This includes 15 credits of General Education courses: 3 credits of GWS courses; 6 credits of GQ courses; and 6 credits of GA, GH, or GS courses.)

PRESCRIBED COURSES (46 credits)
ACCTG 211(4), CMPSC 203 GQ(4), ECON 002 GS(3)[1], ECON 004 GS(3)[1] (Sem: 1-4)
B A 301(2), B A 302(2), B A 303(2), B A 304(2), B A 411(3), ENGL 202D GWS(3) (Sem: 5-6)
ECON 302 GS(3)[1], ECON 304 GS(3)[1], ECON 333 GS(3)[1], ECON 390(3)[1], ECON 404W(3)[1], ECON 490(3)[1] (Sem: 5-8)

ADDITIONAL COURSES (14-16 credits)
MATH 110 GQ(4) or MATH 140 GQ(4) (Sem: 1-2)
MS&IS 200(4) or STAT 200(4) (Sem: 1-2)
M I S 204(2) or IST 110(4) (Sem: 3-4)
B A 243(4), or B A 241(2) and B A 242(2) (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (16 credits)
Select 4 credits: Attainment of 12th credit level proficiency in a single foreign language. Proficiency must be demonstrated by either examination or course work (Sem: 1-4)
Select 6 credits of Global Awareness and Understanding from approved course list (credits must be taken in GA, GH, or GS) (Sem: 1-8)
Select 6 credits[1] of 300- or 400-level Economics courses (at least 3 credits must be at the 400 level). See department list. (Sem: 5-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

ECONOMICS

Penn State Erie, The Behrend College

The Economics major is a program of study with a liberal arts orientation. The broad liberal arts background serves as a foundation for advanced study in the methods and techniques of economic analysis. Use of mainframe and microcomputers as analytical and problem-solving tools is emphasized in the program's upper-division courses. Students may choose upper-division courses in several areas of specialization, including business cycles and forecasting, economic theory, industrial organization, international economics, labor economics, managerial economics, and regional economics.

For the B.A. degree in Economics, a minimum of 122 credits is required. Each student must earn at least a grade of C in each 300- and 400-level course in the major field.

GENERAL EDUCATION: 45 credits
(3 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in ELECTIVES or GENERAL EDUCATION course selection)

ELECTIVES: 19 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 37 credits
(This includes 3 credits of General Education GS courses.)

PRESCRIBED COURSES (19 credits)
ECON 002 GS(3), ECON 004 GS(3), ECON 302 GS(3), ECON 304 GS(3) (Sem: 1-6)
ENGL 202A GWS(3) (Sem: 3-6)
MS&IS 200(4) (Sem: 3-6)

ADDITIONAL COURSES (18 credits)
Select 18 credits in BECON, ECNS, or ECON above the 300 level, in consultation with an adviser. [Where appropriate toward a specialized undergraduate field of study, the student may petition the director of the School of Business to take up to a maximum of 6 credits in closely related fields toward a major.] (Sem: 3-8)

ECONOMICS, B.A.

College of the Liberal Arts
This major is designed for those who seek a broad understanding of the operation of the economic system and training in the methods and uses of economic analysis. Graduates are equipped for employment in many areas of business operations, labor unions, and agencies of government at all levels; and to undertake the graduate work necessary to become professional economists.

Students may choose either a Bachelor of Arts or a Bachelor of Science program. An honors program is also offered.

For the B.A. degree in Economics, a minimum of 120 credits is required.

GENERAL EDUCATION: 45 credits
(0-4 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in ELECTIVES or GENERAL EDUCATION course selection)

ELECTIVES: 17-21 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 34 credits[1]
(This includes 0-4 credits of General Education GQ courses.)

PRESCRIBED COURSES (12 credits)
ECON 002 GS(3), ECON 004 GS(3) (Sem: 3-4)
ECON 302 GS(3), ECON 304 GS(3) (Sem: 5-6)

ADDITIONAL COURSES (4 credits)
MS&IS 200(4) or STAT 200 GQ(4) (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (18 credits)
Select 18 credits in Economics 300 or 400 level with department approval, including at least 9 credits at the 400 level (Sem: 5-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

ECONOMICS, B.S.

College of the Liberal Arts
This major is designed for those who seek a broad understanding of the operation of the economic system and training in the methods and uses of economic analysis. Graduates are equipped for employment in many areas of business operations, labor unions, and agencies of government at all levels; and to undertake the graduate work necessary to become professional economists.

The B.S. degree program is intended for students with a strong interest in quantitative skills. An honors program is also offered.

For the B.S. degree in Economics, a minimum of 120 credits is required.

GENERAL EDUCATION: 45 credits
(6 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in ELECTIVES or GENERAL EDUCATION course selection)

ELECTIVES: 18 credits

REQUIREMENTS FOR THE MAJOR: 63 credits[1]
(This includes 6 credits of General Education GQ courses.)

PRESCRIBED COURSES (26 credits)
ECON 002 GS(3), ECON 004 GS(3) (Sem: 3-4)
ACCTG 211(4), ECON 302 GS(3), ECON 304 GS(3), STAT 200 GQ(4) (Sem: 5-6)
ECON 390(3), ECON 490(3) (Sem: 7-8)

ADDITIONAL COURSES (7 credits)
MATH 110 GQ(4) or MATH 140 GQ(4) (Sem: 3-4)
CMPSC 101 GQ(3) or CMPSC 203 GQ(3) (Sem: 5-6)

SUPPORTING COURSES AND RELATED AREAS (30 credits)
Select 3 credits in social and behavioral sciences from department list (Sem: 1-4)
Select 6 credits in arts, humanities, social and behavioral sciences from department list (Sem: 1-6)
Select 18 credits in economics at the 300 or 400 level with department approval, including at least 6 credits at the 400 level (Sem: 5-8)
Select 3 credits in quantification from department list (Sem: 7-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

ELECTRICAL ENGINEERING

Capital College

The Bachelor of Science degree in Electrical Engineering provides a solid background in electrical engineering sciences. It also provides an opportunity for students to pursue interests in electrical and electronic circuits, including digital circuits and VLSI and its fabrication, microprocessors and their applications, electromagnetics, communications, control systems, and digital image processing and computer vision. Through participation in a senior capstone design, the curriculum emphasizes written as well as verbal communication and teamwork approach among the students to attain a common goal.

This program helps its graduates develop capabilities to analyze and design a variety of electrical and electronic systems found in many industrial and government settings as well as provide a foundation for further graduate studies. A strong background in the fundamentals is built through a broad base core in basic sciences (physics and chemistry) and mathematics as well as engineering sciences.

For a B.S. degree in Electrical Engineering a minimum of 134 credits is required.

ENTRY TO MAJOR REQUIREMENTS: Entry to the Electrical Engineering major requires that the student has completed: MATH 140 GQ(4), MATH 141 GQ(4), PHYS 211 GN(4), and CHEM 012 GN(3), CHEM 014 GN(1). A 2.00 or higher cumulative grade-point average is required.

GENERAL EDUCATION: 45 credits
(21 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 0-1 credits

REQUIREMENTS FOR THE MAJOR: 109-110 credits
(This includes 21 credits of General Education courses: 3 credits of GWS courses; 3 credits of GS courses; 9 credits of GN courses; 6 credits of GQ courses.)

PRESCRIBED COURSES (91 credits)
CHEM 012 GN(3), CHEM 014 GN(1), ED&G 100(3) (Sem: 1-2)
SSET 295(1) (Sem: 4)
MATH 140 GQ(4), MATH 141 GQ(4), MATH 220(2), MATH 230(4), MATH 250(3), PHYS 211 GN(4), PHYS 212 GN(4), PHYS 213 GN(2), PHYS 214 GN(2) (Sem: 1-4)

CSE 271(3)[1], CSE 275(1)[1], E MCH 011(3), ENGL 202C GWS(3) (Sem: 3-4)
CMPEH 472(4), E ENG 317(4)[1], E ENG 361(4), E ENG 354(4)[1], E ENG 355(1)[1], E ENG 368(4)[1], E ENG 422(3), E ENG 430(3) (Sem: 5-6)
COMP 421(3), E ENG 433(4), E ENG 442(1), E ENG 443W(3), E ENG 467(3), E ENG 468(3) (Sem: 7-8)

ADDITIONAL COURSES (9-10 credits)
Select 3 credits from: ECON 002 GS(3) or ECON 004 GS(3) or ECON 014 GS(3) (Sem: 1-4)
Select 3 credits from: CMPSC 201C GQ(3) or CMPSC 201F GQ(3) (Sem: 3-4)
Select 3-4 credits from MA SC 422(3)[1] or STAT 200 GQ(4)[1] (Sem: 4-6)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 9 credits in consultation with an academic adviser and in support of the student's interests. (Sem: 7-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

ELECTRICAL ENGINEERING

College of Engineering

Electrical engineering is the application of electronics, electrical science and technology, and computer systems to the needs of society. Students in the BSEE program at Penn State University Park master electrical engineering theory through lecture-based courses. Additional problem-solving skills and practical experience are developed through design projects and laboratory assignments, which also provide opportunities for the development of team-building and teamwork skills. These design experiences are integrated throughout the curriculum from the first year through the fourth-year capstone design course. In addition, students improve their written and oral communication skills and expand their general knowledge through a variety of additional courses in communications, arts, humanities, and the social studies that complement the technical courses.

A combination of required and elective technical courses ensures that students acquire both a broad knowledge base as well as expertise in one or more areas of specialization. Areas of specialization include antennas, communications, computer engineering, control systems, digital signal processing, electronic and photonic device fabrication and circuit design, energy conversion, fiber optics and lasers, image processing, microwaves and radar, optical computing, power systems, remote sensing, and space sciences.

The program prepares graduates for both professional careers in electrical engineering and advanced study at the graduate level in electrical engineering or a related field. Career opportunities are quite diverse, and they include research, product design and development, manufacturing, technical management, and technical sales.

The curriculum consists of one year of background science and mathematics, followed by three years of engineering course work, including a wide variety of technical electives. The General Education requirements are distributed throughout the four years.

For the B.S. degree in Electrical Engineering, a minimum of 129 credits is required.

GENERAL EDUCATION: 45 credits
(21 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 105-106 credits
(This includes 21 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses; 3 credits of GWS courses.)

PRESCRIBED COURSES (65 credits)
CHEM 012 GN(3), CHEM 014 GN(1), ED&G 100(3), MATH 140 GQ(4), MATH 141 GQ(4), PHYS 211 GN(4), PHYS 212 GN(4) (Sem: 1-2)
CSE 271(3)[1], CSE 275(1), E E 210(4)[1], MATH 220 GQ(2), MATH 230(4), MATH 250(3), PHYS 213 GN(2), PHYS 214 GN(2) (Sem: 3-4)
E E 310(4)[1], E E 324(3)[1], E E 330(4)[1], E E 350(4)[1], E SC 314(3)[1], ENGL 202C GWS(3) (Sem: 5-6)

ADDITIONAL COURSES (16-17 credits)
Select 1 credit of First-Year Seminar (Sem: 1-2)
CMPSC 201C GQ(3) or CMPSC 201F GQ(3) (Sem: 3-4)
Select 3 credits from BIOL 141GN(3), CSE 120(3), E MCH 011(3), M E 023(3), or PHYS 237(3) (Sem: 3-4)
ECON 002 GS(3) or ECON 004 GS(3) (Sem: 3-4)
Select 3-4 credits from I E 424(3), PHYS 410(4), STAT 401(3), STAT 414(3), STAT 416(3), or STAT 418(3) (Sem: 5-6)
E E 402W(3) or E E 403W(3) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (24 credits)
Select 3 credits from program-approved list of 300-level courses (Sem: 5-6)
Select 3 credits from program-approved lists of 300-level or 400-level courses (Sem: 5-6)
Select 9 credits from program-approved list of 400-level courses (these courses must be chosen so that engineering design and engineering science requirements for the major are met) (Sem: 7-8)
Select 3 credits of engineering courses from a program-approved list (Sem: 7-8)
Select 6 additional credits, which may include up to 6 credits of ROTC, up to 6 co-op credits, and others from a program-approved list (Sem: 7-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

ELECTRICAL ENGINEERING

Penn State Erie, The Behrend College

This major provides students with a strong foundation in electrical engineering through a combination of classroom study, projects, and laboratory experience. Analysis and design of electrical and computer systems are stressed. Built upon a core of science and mathematics courses, this major has the objective of educating graduates to be problem solvers. Students acquire the ability to work as members of a team toward successful attainment of a common goal, preparing them for work in industry, or further study in graduate school. In addition, written and oral communication skills are developed from an early stage, culminating in a senior design project that stresses communication as well as engineering content.

In addition to completing a broad-based science and mathematics core, students pursue their interest in electrical engineering by studying the principles of electrical circuits and microelectronics, digital and computer systems, control and communications systems, and electromagnetic fields and waves. Students obtain a broad-based electrical engineering education that is specialized through the selection of technical electives courses. The student will be required to analyze and solve a significant electrical engineering design problem during the senior year.

ENTRANCE REQUIREMENT: In addition to the Carnegie unit and minimum GPA requirements described by University policies, all students applying for entrance to any of the engineering majors at Penn State Erie must have at least a 2.0 cumulative GPA by the end of the semester prior to applying for entrance to the major and have completed, with a minimum grade of C: CHEM 012 GN(3), MATH 140 GQ(4), MATH 141 GQ(4), and PHYSICS 211 GN(4). These courses must be completed by the end of the semester during which the admission to major process is carried out.

For the B.S. degree in Electrical Engineering, a minimum of 130 credits is required. Each student must earn at least a grade of C in each 300- and 400-level course in the major field.

GENERAL EDUCATION: 45 credits
(21 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 106 credits
(This includes 21 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GWS courses; 3 credits of GS courses.)

PRESCRIBED COURSES (91 credits)
CHEM 012 GN(3), CHEM 014 GN(1), BDENG 100S(3), CMPSE 201C GQ(3) (Sem: 1-2)
CSE 271(3)[1], CSE 275(1)[1], MATH 140 GQ(4)[1], MATH 141 GQ(4)[1], MATH 220 GQ(2)[1], MATH 230(4)[1], MATH 250(3)[1], PHYS 211 GN(4)[1], PHYS 212 GN(4), PHYS 214 GN(2) (Sem: 1-4)
E MCH 011(3), ENGL 202C GWS(3), E E 210(4)[1] (Sem: 3-4)
EE BD 322(3), EE BD 323(3), EE BD 324(4), EE BD 326(4), EE BD 327(1), EE BD 410(3), EE BD 421(3), EE BD 425W(4) STABD 303(3) (Sem: 5-6)
EE BD 427(3), EE BD 431(3), EE BD 480(3), EE BD 481(3) (Sem: 7-8)

ADDITIONAL COURSES (6 credits)
ECON 002 GS(3) or ECON 004 GS(3) (Sem: 1-6)
M E 023(3) or M E 030(3) or E MCH 012(3) or CSE 120(3) or PHYS 237(3) (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 9 credits of technical courses from school-approved list.
(These credits must be selected to fulfill the engineering science and design requirements of the major.) (Sem: 7-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

ELECTRICAL ENGINEERING TECHNOLOGY

Capital College; Commonwealth College

The Bachelor of Science graduate with a major in Electrical Engineering Technology (E E T) is an engineering technologist who can bridge the gap between scientific advancement and practical electrical devices and systems. Research in all fields of electrical engineering has produced an abundance of new knowledge in recent years. Many of these advanced scientific achievements have been unused due to the shortage of engineering technologists specifically educated to convert scientific information into practical devices and systems.

The E E T major helps equip students with the various skills necessary to adapt new scientific knowledge to new products. Technical selections are offered in the senior year to provide some degree of specialization, but all graduates receive a well-rounded basic education in electrical and electronic design principles. The strengths of the program include: an applied hands-on program; extensive laboratory experience; promising job placement; accreditation by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012, telephone 410-347-7700, Web at **www.abet.org**.

E E T graduates who wish to continue their professional development can take the Fundamentals of Engineering examination in Pennsylvania, a prerequisite for taking the Professional Engineering examination.

For a B.S. degree in Electrical Engineering Technology, a minimum of 128 credits is required.

ADMISSION REQUIREMENTS FOR TRANSFER STUDENTS: Applicants must have earned a high school diploma or equivalent and have attempted at least 40 semester credits at a regionally accredited college or university with at least a 2.0 cumulative grade-point average (4.0 scale). The evaluation of prior college work is done on an individual basis by the Office of Enrollment Services at Penn State Harrisburg.

ENTRY TO MAJOR REQUIREMENTS: Entry to the Electrical Engineering Technology major requires a 2.00 or higher cumulative grade-point average.

REENROLLMENT: Associate degree students should file a reenrollment form during the final semester of their associate degree. Students reenrolling from an associate's degree into the bachelor's degree should run a degree audit from eLion, using the E E T major code, to determine their curriculum requirements. Similar considerations apply to students changing majors from programs in science or engineering.

Students are directed to **www.psu.edu/bulletins/bluebook/gened** for an explanation of the Penn State General Education requirements.

GENERAL EDUCATION: 45 credits
(18 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 5-14 credits

REQUIREMENTS FOR THE MAJOR: 87-96 credits
(This includes 18 credits of General Education courses: 3 credits of GWS courses; 9 credits of GN courses; 6 credits of GQ courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 61-70 credits

PRESCRIBED COURSES (27 credits)
CHEM 012 GN(3), CHEM 014 GN(1), MATH 140 GQ(4), MATH 141 GQ(4) (Sem: 1-6)
E E T 312(4)[1], E E T 330(4)[1], ENGL 202C GWS(3) (Sem: 5-6)
E E T 419(1), E E T 420W(3) (Sem: 7-8)

ADDITIONAL COURSES (34-43 credits)
Select 2*-3 credits from: EG T 101(1) and EG T 102(1) or ED&G 100(3) (Sem: 1-2)
Select 3 credits from: CMPSC 101 GQ(3), CMPSC 201C GQ(3), or CSE 103 GQ(3) (Sem: 1-5)
Select 6*-8 credits from sequence a or b:
a.) PHYS 150 GN(3) and PHYS 151(3) (Sem: 3-4)
b.) PHYS 211 GN(4) and PHYS 212 GN(4) (Sem: 1-4)
Select 3-4 credits from MA SC 422(3), MA SC 440(3), MA SC 450(3), MA SC 460(3), MATH 230(3), MATH 250(3), or STAT 200 GQ(4) (Sem: 5-6)
Select 7-8* credits from course sequence a, b, or c:
a.) EE T 114(4) and E E T 311(4)[1] (Sem: 1-6)
b.) E E 210(4)[1] and E ENG 352(3)[1] (Sem: 3-6)
c.) E ENG 354(5)[1] and E ENG 355(2) (Sem: 5-6)
Select 4* credits from: CSE 271(3) and CSE 275(1) or EE T 117(3) and EE T 120(1) (Sem: 1-4)
Select 3*-4 credits from: CMPEH 472(4) or EE T 211(3) (Sem: 3-6)

Select 3*-4 credits from: EE T 205(1) and EE T 210(2) or E ENG 368(4) (Sem: 3-6)
Select 3-5* credits from: EE T 213W(5) or E ENG 422(3) (Sem: 3-6)
*Courses required by PSU 2 EET programs

REQUIREMENTS FOR THE OPTION: 26 credits

COMPUTER ENGINEERING TECHNOLOGY OPTION: 26 credits

PRESCRIBED COURSES (11 credits)
E E T 403(4), CMPET 401(3), CMPET 402(1), CSE 431(3) (Sem: 5-8)

ADDITIONAL COURSES (15 credits)
2nd Programming Elective: Select 3 credits from: COMP 350(3), COMP 430(3), COMP 432(3), CSE 120(3), E T 324(3) (Sem: 7-8)
Applications Elective: Select 4 credits of technical electives from: E E T 412(4), E E T 423(4), E E T 456(4) (Sem: 7-8)
CMPET Technical Electives: Select 8 credits from CMPEH 449(3), E E 418(3), E E 453(3), E E T 402(4), E E T 408(4), E E T 413(4), E E T 414(4), E E T 478(4), E ENG 430(3), E T 496(1) (Sem: 7-8)

GENERAL ELECTRICAL ENGINEERING TECHNOLOGY OPTION: 26 credits

ADDITIONAL COURSES (26 credits)
System Elective: Select 8 credits of technical electives from: E E T 408(4), E E T 409(4), E E T 433(4) (Sem: 7-8)
Electronics Elective: Select 4 credits from: E E T 402(4), E E T 407(4), E E T 423(4), E E T 431(4) (Sem: 7-8)
GEET Technical Electives: Select 8 credits of GEET technical electives from: CMPEH 449(3), CMPET 401(3), CMPET 402(1), CSE 431(3), E E 418(3), E E 453(3), E E T 401(4), E E T 403(3), E E T 410(4), E E T 412(4), E E T 413(4), E E T 414(4), E E T 456(4), E E T 478(4), E ENG 455(3), E T 496(1) (Sem: 7-8)
Select 6 credits from any previouse elective list plus COMP 401(3), E MCH 011(3), E MCH 012(3), M E T 311(3) (Sem: 6-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

ELECTRICAL ENGINEERING TECHNOLOGY

Penn State Erie, The Behrend College

This major helps prepare graduates graduates for careers in such varied areas as electronics, microprocessors, communications, instrumentation and control, and power. The curriculum provides thorough training in applied mathematics, physics, electrical and electronic circuit analysis and design, microprocessors, instrumentation and control theory, communication systems, power systems, and quality control. Graduates may qualify as engineering technologists working side-by-side with engineers, scientists, and other skilled workers in these capacities. Positions include electrical and electronic systems design, microprocessor applications, instrumentation and control, electrical testing, plant engineering, quality control, management, and technical sales and service. This program is accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology.

This program is primarily for graduates of a TAC of ABET-accredited electrical engineering technology associate degree program who want to obtain a baccalaureate degree.

For the B.S. degree in Electrical Engineering Technology, a minimum of 130 credits is required. Each student must earn at least a grade of C in each 300- and 400-level course in the major field.

GENERAL EDUCATION: 45 credits
(21 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 1 credit

REQUIREMENTS FOR THE MAJOR: 105 credits
(This includes 23 credits of General Education courses: 6 credits of GN courses; 6 credits of GQ courses; 6 credits of GWS courses; and 3 credits of GS courses.)

PRESCRIBED COURSES (77 credits)
E T 002(1), E T 005(1), EE T 101(3), EE T 109(1), EE T 114(4)[1], EE T 117(3)[1], EE T 118(1)[1], EE T 120(1), EG T 101(1), EG T 102(1), PHYS 150 GN(3) (Sem: 1-2)

EE T 205(1), EE T 210(2), EE T 211(3), EE T 213W(5), EE T 216(3), EE T 221(1), PHYS 151 GN(3) (Sem: 3-4)
CAS 100 GWS(3), ENGL 202C GWS(3) (Sem: 3-6)
EETBD 301(3), EETBD 330(3), EETBD 341(3), EETBD 415(3), EETBD 455(3), MTHBD 210(4), MTHBD 211(4) (Sem: 5-6)
EETBD 416(3), EETBD 440(3), EETBD 480(1), EETBD 490W(3) (Sem: 7-8)

ADDITIONAL COURSES (19 credits)
ECON 002 GS(3) or ECON 004 GS(3) (Sem: 1-8)
MATH 081 GQ(3), MATH 082 GQ(3), and MATH 083 GQ(4); or MTHBD 091 GQ(5) and MTHBD 092 GQ(5) (Sem: 1-4)
EETBD 450(3) or Q C 450(3) (Sem: 5-8)
EETBD 275(3) or EE T 220(2) and 1 credit in 200 level or higher of technical electives from school-approved list (Sem: 4-8)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 9 credits of technical electives at the 300 or 400 level from school-approved list (Students may apply 6 credits of ROTC.) (Sem: 7-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

ELECTRO-MECHANICAL ENGINEERING TECHNOLOGY

Altoona College; Berks-Lehigh Valley College; Commonwealth College; College of Engineering

This major provides the basic undergraduate education required for a profession as an electro-mechanical engineering technologist. The program emphasizes a breadth of knowledge in all fields of engineering technology related to typical manufacturing, production, and assembly plant process. Basic coverage is provided in all major areas of technology involved in the operation and control of manufacturing and production processes, including instrumentation and monitoring methods, principles of machine design, automated control techniques, thermal and fluid sciences, computerized manufacturing systems, principles of electrical and electronic circuit operation, computer-aided drafting and design, economics of production, and statistical analysis and quality control.

The program is organized as a 2+2 program in which entering students are expected to have an associate degree in either electrical or mechanical engineering technology from Penn State or from a Technology Accreditation Commission of the Accreditation Board for Engineering and Technology accredited mechanical or electrical engineering technology program at another institution or community college. Students seeking admission to this program from related engineering technology programs other than mechanical or electrical technology will be considered on a case-by-case basis.

For the B.S. degree in Electro-Mechanical Engineering Technology, a minimum of 130 credits is required. Of these credits, 67 are required for admission to the major; the remaining 63-64 credits are required in semesters five through eight. This program is accredited by the Technology Accreditation Commission of ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202-4012, telephone: 410-347-7700, or **www.abet.org**.

GENERAL EDUCATION: 45 credits
(21 of these 45 credits are included in the REQUIREMENTS FOR ADMISSION TO THE MAJOR; an additional 12 credits are included in REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin. Note: The Accreditation Board for Engineering and Technology [ABET] does not permit the use of skills courses to satisfy the Arts category of General Education.)

FIRST-YEAR SEMINAR: (Not required for a "2+2 program")
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR ADMISSION TO THE MAJOR: 67 credits
(This includes 21 General Education credits)
Entering students are required to have earned an associate degree in either electrical or mechanical engineering technology or similarly named program. The degree program must have included at least 67 credits (or equivalent), including a minimum of 36 credits in technical courses, 10 credits of college-level mathematics including calculus, 6 credits of basic science, 6 credits of communications courses, and a total of 9 credits in arts, humanities, and social and behavioral sciences.

REQUIREMENTS FOR THE MAJOR: 51-52 credits
(This includes 12 credits of General Education courses: 6 credits of GQ courses; 3 credits of GN courses; 3 credits of GWS courses.)

PRESCRIBED COURSES (48-49 credits)
ENGL 202C GWS(3), MATH 141 GQ(4)[1], MATH 250(3), CMPSC 101 GQ(3) (Sem: 5-6)
CHEM 012 GN(3), EMET 350(3), EMET 405(4), EMET 410(4), EMET 440(3), IE T 105(2) (Sem: 7-8)
Select a or b (16-17 credits)
a. Students entering with a 2-EET degree must complete the following courses: EMET 311(3), EMET 322(4)[1], EMET 330(3)[1], IE T 216(2), IE T 215(2), ME T 210W(3) (Sem: 5-6)
b. Students entering with a 2-MET degree must complete the following courses: EE T 220(2), EMET 310(3), EMET 320(4)[1], EMET 321W(4), EMET 330(3)[1] (Sem: 5-6)

ADDITIONAL COURSES (3 credits)
EMET 420(3), EMET 430(3), or EMET 497(3) (Sem: 7)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

ELEMENTARY EDUCATION & EARLY CHILDHOOD EDUCATION

Capital College

The Elementary Education program is characterized by its humanistic approach to teaching. The program offers extensive field experiences in the junior and senior years prior to student teaching and emphasizes the problems of suburban and urban teachers. An objective of the program is the development of self-awareness and independence in students, which can free them from the typical dependent relationships with instructors. Thus, a student is expected to exhibit initiative and self-direction toward professional goals and demonstrate professional behavior in contacts with school personnel.

Prior to the full-time student teaching experience in the senior year, students are expected to complete all other courses required for certification, including two part-time placements. On-campus courses are scheduled three or four days a week, while field experiences in nearby schools are scheduled part-time, three or four days per week.

For a B.El.Ed. degree in Elementary Education, a minimum of 127 credits is required.

For a B.El.Ed. degree in Elementary Education with Early Childhood Education Certification, a minimum of 140 credits is required.

ADMISSION REQUIREMENTS FOR TRANSFER STUDENTS: Applicants should have completed most of their first two years of college as well as the Entry to Major Requirements listed above with at least a 3.0 cumulative GPA (4.0 scale). The evaluation of prior college work is done on an individual basis by the Office of Enrollment Services at Penn State Harrisburg. Students should request a change-of-assignment to Penn State Harrisburg during their fourth semester, to be effective for the next semester of enrollment.

ENTRY TO MAJOR REQUIREMENTS: Entry to the Elementary Education major or the Elementary Education major with Early Childhood Certification requires the completion of 57 or more credits in required courses and the state's minimum cumulative GPA criteria of 3.0. Students must complete, with a grade of "C" or better, six (6) credits of college-level mathematics (MATH or STAT prefix), three (3) credits of college-level English literature and three (3) credits of college-level English composition. Students thinking seriously about education should plan their freshman and sophomore years carefully. Semesters 5 through 8 are very structured. (see also Teacher Education Programs)

SELECTIVE RETENTION: Prior to the end of the first semester at Penn State Harrisburg, students will be required to submit their scores of the Praxis I examinations in reading, writing and mathematics. Retention is contingent on the student's maintaining a cumulative GPA of 3.0 or higher, demonstrating proficiency in written and spoken communications, receiving the recommendation of the faculty, and fulfilling all core course requirements.

GENERAL EDUCATION: 45 credits
(27 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education Course Requirements in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 8-11 credits

REQUIREMENTS FOR THE MAJOR: 101-111 credits[1]
(This includes 27 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 6 credits of GH courses; 6 credits of GS courses)

PRESCRIBED COURSES (68 credits)
EDUC 302(3), EDUC 305(3), EDUC 421(3), EDUC 462(3), EDUC 470(3) (Sem: 5-6)
EDMTH 301(3), EDUC 304(3), EDUC 320(3), EDUC 352(3), EDUC 353(3), EDUC 495A(1) (Sem: 5-6)
EDMTH 302(3), EDSCI 454(3), EDUC 303 DF(3), EDUC 321(3), EDUC 371(3), EDUC 495B(1) (Sem: 7-8)
SS ED 430W(3) (Sem: 7-8)
EDUC 385(3), EDUC 490(12), HLTH 306(2) (Sem: 7-8)

ADDITIONAL COURSES (30-40 credits)
Select 3 credits of GN physical science from: ASTRO, CHEM, EARTH, EM SC, GEOSC, MATSC, MATSE, METEO, PHYS (Sem: 1-4)
Select 3 credits of GN biological science from: B M B, BIOL, BI SC (Sem: 1-4)
Select 3 credits of GN environmental science from: BI SC 003 GN(3), BIOL 020 GN;GI(3), BIOL 027 GN(3), or HORT 101 GN(3) (Sem: 1-4)
Select 3 credits from: ECON 002 GS(3), ECON 004 GS(3), or ECON 014 GS(3) (Sem: 1-4)
Select 3 credits from: HIST 003 GH(3), HIST 012 GH(3), HIST 020 GH(3), or HIST 021 GH(3) (Sem: 1-4)
Select 6 credits from: MATH 017 GQ(3), MATH 018 GQ(3), MATH 021 GQ(3), MATH 022 GQ(3), MATH 026 GQ(3), MATH 040 GQ(5), MATH 110 GQ(4), MATH 200 GQ(3), MATH 220 GQ(2), STAT 100 GQ(3), STAT 200 GQ(4), STAT 250 GQ(3), or STAT 301 GQ(3) (Sem: 1-4)
Select 3 credits from: PSY 213 GS(3) or HD FS 229 GS(3) (Sem: 1-4)
Select 3 credits of literature from: CMLIT 001 GH(3), CMLIT 001H GH(3), CMLIT 002 GH;GI(3), CMLIT 003 GH;GI(3), CMLIT 004 GH;GI(3), CMLIT 004H GH;GI(3), CMLIT 005 GH;GI(3), CMLIT 006 GH(3), CMLIT 010 GH;GI(3), CMLIT 011 GH;GI(3), CMLIT 100 GH;GI(3), CMLIT 101 GH;GI(3), CMLIT 105 GH;GI(3), CMLIT 106 GH;GI(3), CMLIT 107 GH;GI(3), CMLIT 108 GH;GI(3), CMLIT 110 GH;GI(3), CMLIT 111 GH;GI(3), CMLIT 141 GH;GI(3), CMLIT 184 GH(3), CMLIT 185 GH(3), CMLIT 189 GH(3), ENGL 001 GH(3), ENGL 001W GH(3), ENGL 002 GH(3), ENGL 003 GH(3), ENGL 104 GH(3), ENGL 129 GH(3), ENGL 129H GH(3), ENGL 133 GH(3), ENGL 134 GH(3), ENGL 135 GH;GI(3), ENGL 135S GH;GI(3), ENGL 139 GH;GI(3), ENGL 140 GH(3), ENGL 180 GH(3), ENGL 182 GH;GI(3), ENGL 184 GH(3), ENGL 184S GH(3), ENGL 185 GH(3), ENGL 189 GH(3), ENGL 191 GH(3), ENGL 194 GH;GI(3), ENGL 194H GH;GI(3), ENGL 262 GH(3), ENGL 263 GH(3), ENGL 265 GH(3), ENGL 268 GH(3) (Sem: 1-4)
Select 3-13 credits from one of the following:
a) for the degree in Elementary Education take EDUC 315 GI(3) (Sem: 5-6)
b) for the degree in Elementary Education with Early Childhood Education Certification take EDUC 401(3), EDUC 403(3), EDUC 404(3), EDUC 410(3), EDUC 495(1) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (3 credits)
Select 3 credits of geography (Sem: 1-6)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

ELEMENTARY AND KINDERGARTEN EDUCATION

Altoona College: Elementary Education Teaching Option; College of Education

This major offers teaching options in Early Childhood Education and in Elementary Education. Students successfully completing this major will have met all of the requirements for the K-6 or N-3 College Instructional I certificate issued by the Pennsylvania Department of Education. Students must indicate their choice of teaching option at the time they make application for admission to a teacher education major at the conclusion of their second semester. Students who are undecided at this time about which teaching option to select should contact their adviser and enroll in a field experience featuring participation in the classroom.

The executive vice president and provost of the University has approved administrative enrollment controls for this major. The number of students admitted each year to this major is limited. Additional information about appyling for this major is available in the dean's office in the College of Education (See **www.ed.psu.edu/certification**).

For the B.S. degree in Elementary and Kindergarten Education with the Early Childhood Teaching option, or with the Elementary Education Teaching option, a minimum of 130 credits is required. (See also Teacher Education Programs.)

EARLY CHILDHOOD TEACHING OPTION: Students successfully completing this option will have met all of the requirements for the N-3 Instructional I certificate issued by the Pennsylvania Department of Education. Special courses in both human development and education are used to integrate understanding of preschool programs with relevant theories of child development.

ELEMENTARY EDUCATION TEACHING OPTION: Students successfully completing this option will have met all of the requirements for the K-6 Instructional I certificate issued by the Pennsylvania Department of Education.

GENERAL EDUCATION: 45 credits
(9-15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 3-6 credits

REQUIREMENTS FOR THE MAJOR: 94-96 credits
(This includes 9-15 credits of General Education courses: 6 credits of GS and 3 credits of GQ courses for both options. In addition, 3 credits of GH may be selected in both options. Further, there are 3 credits of GH courses for the Elementary Education Teaching option. In the Early Childhood Teaching option 3 credits of GHA courses may be selected.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 65 credits[1]

PRESCRIBED COURSES (53 credits)
PSY 002 GS(3), PSY 213 GS(3), EDPSY 014(3), ENGL 100(3), C I 295(2) (Sem: 1-2)
A ED 303(3), EDTHP 115(3), KINES 126(3), MATH 200 GQ(3) (Sem: 3-6)
C I 495D(12), C I 495F(3), LL ED 400(3), MTHED 420(3), SPLED 400(3), SS ED 430W(3) (Sem: 5-8)

ADDITIONAL COURSES (6 credits)
ECON 002 GS(3), ECON 004 GS(3), ECON 014 GS(3), or ECON 187(3) (Sem: 1-8)
GEOG 020 GS(3), GEOG 030 GS(3), GEOG 100 GS(3), GEOG 102 GH(3), GEOG 103 GS;DF(3), GEOG 120 GS(3), GEOG 124 GS(3), GEOG 128 GS;DF(3), or GEOG 200(3) (Sem: 1-8)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 3 credits in EDTHP at the 400 level (Sem: 5-8)
Select 3 credits in American history (Sem: 1-8)

REQUIREMENTS FOR THE OPTION: 29-31 credits

EARLY CHILDHOOD TEACHING OPTION: 29 credits[1]

PRESCRIBED COURSES (20 credits)
MUSIC 240(3) (Sem: 3-6)
E C E 451(3), E C E 452(3), E C E 453(2), E C E 454(3), E C E 479(3), C I 495A(3) (Sem: 5-8)

ADDITIONAL COURSES (9 credits)
H P A 101(3) or NUTR 251 GHA(3) (Sem: 1-2)
HD FS 315 DF(3) or SOC 030 GS(3) (Sem: 1-4)
HD FS 428(3) or HD FS 429(3) (Sem: 5-8)

ELEMENTARY EDUCATION TEACHING OPTION: 31 credits[1]

PRESCRIBED COURSES (16 credits)
KINES 380(1), MUSIC 241(3) (Sem: 1-2)
C I 495B(3), LL ED 401(3), LL ED 402(3), SCIED 458(3) (Sem: 5-8)

ADDITIONAL COURSE (3 credits)
HIST 020 GH(3) or HIST 021 GH(3) (Sem: 1-4)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Academic concentration—select 12 credits from department recommendations (Sem: 1-4)

Note: The Environmental Education certificate may be earned by completing ASTRO 010 GN(2) and ASTRO 011 GN(1), or METEO 003 GN(3); 3 credits from AG BM 101 GS(3), ECON 002 GS(3), ECON 004 GS(3), or ECON 014 GS(3); 3 credits from BI SC 003 GN(3), BIOL 220W(4), or W F S 309(3); 12 additional credits from biological and environmental sciences; 3 credits from the earth or soil sciences; 3 credits from the physical sciences; 3 credits from E R M 411(3), E R M 412(3), and E R M 413W(3); R P M 325(3); R P M 430(3) or AG ED 395(1-13); SCIED 457(3); S T S 200 GS(3).
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.
[18] A grade of C or better per course is required for teacher certification.

ENERGY, BUSINESS, AND FINANCE

College of Earth and Mineral Sciences; Smeal College of Business
This major, offered jointly by the College of Earth and Mineral Sciences and the Smeal College of Business, combines training in business, economics, finance, and the physical sciences with a core of classes focusing on the energy and related industries. The major helps students prepare for careers in the energy industry, as well as financial institutions, non-profit groups, and international organizations dealing with energy issues. The curriculum also provides a strong base for further study in business, economics, law, and social sciences.

For the B.S. degree in Energy, Business and Finance, a minimum of 120 credits is required.

GENERAL EDUCATION: 45 credits
(30 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 21-26 credits

REQUIREMENTS FOR THE MAJOR: 79-84 credits
(This includes 30 credits of General Education Courses: 9 credits of GN courses, 9 credits of GWS courses, 6 credits of GQ courses, and 6 credits of GS courses.)

PRESCRIBED COURSES (37 credits)
ECON 002 GS(3)[1], EM SC 100S GWS(3), ENNEC 100 GS(3)[1] (Sem: 1-2)
ACCTG 211(4), ECON 302 GS(3) (Sem: 3-4)
EM SC 301(3), EM SC 304(3) (Sem: 5-6)
I B 303 GI(3), INS 301(3) (Sem: 5-8)
EM SC 401(3)[1], ENNEC 473(3), ENNEC 484W(3)[1] (Sem: 7-8)

ADDITIONAL COURSES (42-47 credits)
CMPSC 101 GQ(3) or CMPSC 203 GQ(4) (Sem: 1-2)
ENGL 015 GWS(3) or ENGL 030 GWS(3) (Sem: 1-2)
MATH 110 GQ(4) or MATH 140 GQ(4) (Sem: 1-2)
B A 243(4) or B LAW 243(3) (Sem: 3-4)
ECON 004 GS(3)[1] or GEOG 100 GS(3)[1] (Sem: 3-4)
ENNEC 472(3) or MS&IS 200(4) or STAT 200 GQ(4) (Sem: 3-4)
IST 110(4) or M I S 204(2) (Sem: 3-4)
ENGL 202C GWS(3) or ENGL 202D GWS(3) (Sem: 7-8)
Select 9 credits from: EGEE 101 GN(3), EGEE 102 GN(3), GEOG 110 GN(3), GEOG 115 GN(3), GEOSC 020 GN(3), GEOSC 021 GN(3), MATSE 081 GN(3), METEO 003 GN(3), METEO 101 GN(3) (Sem: 3-6)
Select 9 credits from: ECON 428(3), EM SC 420(3), GEOG 406(3), GEOG 410(3), GEOG 470(3), GEOSC 402W GI(3), GEOSC 454(3), METEO 473(3) (Sem: 5-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

ENGINEERING SCIENCE

College of Engineering

Engineering Science is a multidisciplinary honors program that emphasizes enhanced understanding and integrated application of mathematical, scientific, statistical, and engineering principles. The program is unique because the Engineering Science graduate forgoes specialization in a single engineering discipline in exchange for a broader perspective of engineering and the ability to interact with a team of allied professionals. The curriculum, founded upon mathematics, chemistry, physics, mechanics, and materials, is designed for students who seek to link science with the engineering disciplines. Examples include, but are not limited to, electrical, mechanical, chemical, civil and bioengineering. During the senior year, all students select a focus area of interdisciplinary study, complete a capstone project and write a thesis that integrates the scientific principles of research, design and analysis and applies them to engineering. Hence, Engineering Science students achieve both depth and breadth in science and engineering, are able to function across disciplines, and graduate well prepared for advanced studies as well as professional employment.

The specific program objectives are tied to the mission of the program as described above. They target the major outcomes expected of Engineering Science students and are flexible and readily adaptable to meet changing constituent needs.

The Engineering Science Program aims to develop graduates who:

—Are prepared for advanced study and lifetime learning.

—Recognize multi-faceted issues of technical problems, comprehend the importance of each, interact in diverse teams necessary to their solution, and effectively communicate these solutions across disciplines.

—Can identify, analyze, and solve independently a technical problem, in particular the research aspect of their senior thesis.

—Are able to communicate through written reports and papers and explain their work clearly in oral presentations.

—Can select, proficiently apply, and interpret results of state-of-the-art engineering tools.

—Understand from a global perspective: technology and its impact on societies; ethics and its impact upon the profession, citizenship, and humanity; and act responsibly.

Enrollment is limited to students who have demonstrated that they can benefit from the advanced courses of the curriculum. A minimum grade-point average of 3.0 is partial demonstration of such competence.

For the B.S. degree in Engineering Science, 137 credits and a 2.50 grade-point average are required. This baccalaureate program in Engineering Science is accredited by the Engineering Accreditation Commission of ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202-4012; telephone 410-347-7700; or **www.abet.org**.

GENERAL EDUCATION: 45 credits
(21 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 113 credits
(This includes 21 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses; 3 credits of GWS courses.)

PRESCRIBED COURSES (79 credits)
CHEM 012 GN(3), CHEM 013 GN(3), CHEM 014 GN(1), ED&G 100(3), MATH 140 GQ(4), MATH 141 GQ(4), PHYS 211 GN(4) (Sem: 1-2)
MATH 220 GQ(2), MATH 230(4), MATH 251(4), PHYS 212 GN(4), PHYS 213 GN(2), PHYS 214 GN(2) (Sem: 3-4)
AERSP 308(3), E E 210(4), E E 340(3), E SC 400H(3), E SC 407H(3)[1], E SC 414M(3)[1], M E 120(4), PHYS 237(3) (Sem: 5-6)
E SC 404H(3)[1], E SC 410H(3), E SC 411H(4), ENGL 202C GWS(3) (Sem: 7-8)

ADDITIONAL COURSES (22 credits)
Select 1 credit of First-Year Seminar (Sem: 1-2)
CMPSC 201C GQ(3) or CMPSC 201F GQ(3) (Sem: 1-2)
ECON 002 GS(3), ECON 004 GS(3), or ECON 014 GS(3) (Sem: 1-2)
E MCH 110H(5)[1] or E MCH 210(5)[1]; E MCH 012(3)[1] or E MCH 112H(3)[1] (Sem: 3-4)
E MCH 416H(3) or E SC 314(3) (Sem: 5-6)
I E 424(3) or NUC E 307(3) Sem: 5-6)
Select 1 credit of engineering technology laboratory (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (12 credits)[32]
Select 12 credits of 400-level technical courses (Students may apply 6 credits of ROTC or 3 credits of co-op experience.) (Sem: 5-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
[32] Three credits in engineering science, 2 credits in engineering design.

ENGLISH

Abington College; Altoona College; Commonwealth College; College of the Liberal Arts
Majors explore the imaginative and practical uses of English through courses in literature, writing, rhetoric, and language. They develop perspectives on human nature and cultural values through American, British, and other English literatures; they learn how to gather, analyze, synthesize, and communicate information; they gain mastery over their language. These skills help English majors find careers in such fields as publishing, business, industry, government, and teaching. English majors often go on to postgraduate study not only in English but in such areas as law, business, education, and other liberal disciplines.

Majors can emphasize writing, literature, or rhetoric, or a mix of literature, writing, and rhetoric. All provide a liberal education and all develop analytic and writing skills. Qualified students may participate in the career internship and in the English honors program.

Students interested in earning certification in secondary education should contact the College of Education, Department of Curriculum and Instruction. (See also Teacher Education Programs.)

For the B.A. degree in English, a minimum of 123 credits is required.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 18 credits
BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 36 credits[1]

PRESCRIBED COURSES (3 credits)
ENGL 200(3) (Sem: 1-6)

ADDITIONAL COURSES (12 credits)
Select 3 credits from ENGL 221(3) or ENGL 221W(3) (Sem: 1-6)
Select 3 credits from ENGL 222(3), ENGL 222W(3), ENGL 231(3), ENGL 231W(3), ENGL 232(3), ENGL 232W(3), ENGL 235 GI(3), or ENGL 240(3) (Sem: 1-6)
Select 3 credits from ENGL 261(3), ENGL 262 GH(3), ENGL 263 GH(3), ENGL 265 GH(3), or ENGL 268 GH(3) (Sem: 1-6)
Select 3 credits from ENGL 310H(3) or ENGL 487W(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (21 credits)
Select 6 credits in literature, writing, or rhetoric (Sem: 1-8)
Select 3 credits at the 300 or 400 level in literature primarily before 1800 from department list (Sem: 5-8)
Select 3 credits at the 300 or 400 level in literature primarily after 1800 from department list (Sem: 5-8)
Select 9 credits at the 300 or 400 level in literature, writing, or rhetoric (Sem: 5-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

ENGLISH

Capital College

This English major, with its two options, offers students the unique opportunity to study literature in an interdisciplinary context where the relationships among literature and art, history, music, philosophy, media, and American Studies can be investigated. The major offers courses in American, British, and world literatures, emphasizing their cultural and historical contexts as well as teaching students to interpret them from a variety of critical perspectives. Small classes in both creative and expository writing encourage students to develop their writing skills by working closely with faculty.

For a B.Hum. degree in English, a minimum of 120 credits is required. For the B.Hum. degree in English with Secondary Education option, a minimum of 123 credits is required.

GENERAL ENGLISH OPTION: With its emphases on interpretive skills, creativity, and writing, the General English option provides a foundation for careers in such fields as publishing, public relations, communication, government and law, as well as a strong basis for graduate education.

SECONDARY EDUCATION OPTION: The Secondary Education option prepares students to meet the requirements, as established by the Pennsylvania Department of Education, to be certified for the Intructional I Certificate in Communication/English.

The following requirements for entry to the Secondary Education option are in addition to those for entrance to the ENGCL major: (1) Students must have a cumulative grade-point average to meet or exceed the state's required minimum GPA of 3.0. (2) In addition the students must have a grade of "C" or better in 6 credits of college-level mathematics (MATH or STAT prefixes), 3 credits of college-level English literature, and 3 credits of English composition.

ENTRY TO MAJOR REQUIREMENTS: Entry to the English major requires a 2.00 or higher cumulative grade-point average.

RETENTION TO SECONDARY EDUCATION OPTION REQUIREMENTS: (1) Prior to the end of the first semester at Penn State Harrisburg, students will be required to submit scores of the Praxis I examinations in reading, writing, and mathematics. (2) Prior to applying to student teach, students must submit a passing Writing Proficiency Portfolio that demonstrates their proficiency as writers. See English program coordinator for specific instructions and deadlines.

GENERAL EDUCATION: 45 credits
(0-6 of these credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 0-18 credits

BACHELOR OF HUMANITIES DEGREE REQUIREMENTS: 18 credits
(See description of Bachelor of Humanities Degree Requirements in Bulletin.)

REQUIREMENTS FOR THE MAJOR: 45-60 credits
(This includes 6 of General Education Arts (GA) and/or Social and Behavioral Science (GS) courses for the General English Option.)
At least 15 credits of Prescribed, Additional, and/or Supporting courses must be taken at the 400 level.

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 27 credits

PRESCRIBED COURSES (6 credits)[1]
ENGL 200W(3) (Sem: 5-6)
ENGL 444(3) (Sem: 7-8)

ADDITIONAL COURSES (9 credits)
Select 3 credits from the following: ENGL 231(3), ENGL 231W(3), ENGL 232(3), ENGL 232W(3) (Sem: 3-8)
Select 3 credits from the following: ENGL 221(3), ENGL 221W(3), ENGL 222(3), ENGL 222W(3) (Sem: 3-8)
Select 3 credits from the following: ENGL 489 DF(3), ENGL 492 DF(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 3 credits in American ethnic literature or African-American literature from department list (Sem: 3-8)
Select 3 credits in world literature or comparative literature from department list (Sem: 3-8)
Select 3 credits in American literature at the 300 or 400 level from department list (Sem: 5-8)[1]
Select 3 credits in British literature at the 300 or 400 level from department list (Sem: 5-8)[1]

REQUIREMENTS FOR THE OPTION: 18-33 credits

GENERAL ENGLISH OPTION: 18 credits

ADDITIONAL COURSES (6 credits)
Select 3 credits from the following: ENGL 212(3), ENGL 213(3), ENGL 412(3), ENGL 413(3), ENGL 420(3), ENGL 421(3) (Sem: 3-8)[1]
Select 3 credits from the following ENGL 100(3), ENGL 191 GH(3), ENGL 262 GH(3), ENGL 263 GH(3), ENGL 265 GH(3), ENGL 268 GH(3), ENGL 400(3), ENGL 401(3), ENGL 407(3), ENGL 458(3), ENGL 482(3) (Sem: 3-8)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 6 credits from English courses other than British and American literature (Sem: 3-8)
Select 6 credits from General Education Arts (GA) and/or Social and Behavioral Sciences (GS) (Sem: 3-8)

SECONDARY EDUCATION OPTION: 33 credits

PRESCRIBED COURSES (30 credits)
EDUC 313(2), EDUC 314(3), EDUC 315 GI(3), EDUC 322(3), EDUC 416(3), EDUC 435(1), EDUC 490(1-12) (Sem: 5-8)
ENGL 470(3) (Sem: 6-7)[1]

ADDITIONAL COURSES (6 credits)
Select 3 credits from the following: ENGL 100(3), ENGL 407(3) (Sem: 3-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

ENGLISH

Penn State Erie, The Behrend College
This major offers courses in literary and cultural studies, and in various forms of writing. Students majoring in English may select the Literature or the Creative Writing option. Both options provide a sound foundation in the liberal arts and opportunities to develop creative and analytical skills. Students in either option select courses from three separate areas—The Canon and Its Critics, Cultural Studies, and Globality and Literature—and develop a broad understanding of the ways in which literature works in various critical and cultural contexts.

For the B.A. degree in English, a minimum of 121 credits is required. Each student must earn at least a grade of C in each 300- and 400-level course in the major field.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)

INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 9 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 43 credits

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 16 credits

PRESCRIBED COURSES (16 credits)
CMPBD 100(1) (Sem: 1-4)
ENGL 200(3) (Sem: 3-4)
ELISH 300(3), 301(3) (Sem: 3-6)
ELISH 448(3) (Sem: 5-8)
ELISH 494A(3) (Sem: 7-8)

REQUIREMENTS FOR THE OPTION: 27 credits

CREATIVE WRITING OPTION: 27 credits

PRESCRIBED COURSES (3 credits)
ELISH 484W(3) (Sem: 5-8)

ADDITIONAL COURSES (15 credits)
Select 12 credits from school-approved writing workshops in ENGL or ELISH, with at least 6 credits at the 400 level (Sem: 3-8)
Select 3 credits from a 400-level literature course in one of three areas (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select one course from The Cannon and Its Critics(3) (Sem: 1-8)
Select one course from Globality and Literature(3) (Sem: 1-8)
Select one course from Cultural Studies(3) (Sem: 1-8)

LITERATURE OPTION: 27 credits

PRESCRIBED COURSES (3 credits)
ELISH 482(3) (Sem: 5-8)

ADDITIONAL COURSES (18 credits)
Select 3 credits at the 200 level or below from The Canon and Its Critics (Sem: 1-8)
Select 3 credits at the 200 level or below from Globality and Literature (Sem: 1-8)
Select 3 credits at the 200 level or below from Cultural Studies (Sem: 1-8)
Select 3 credits at the 400 level from The Canon and its Critics (Sem: 5-8)
Select 3 credits at the 400 level from Globality and Literature (Sem: 5-8)
Select 3 credits at the 400 level from Cultural Studies (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits in any area at any level (Sem: 1-8)

ENVIRONMENTAL ENGINEERING

Capital College

The Environmental Engineering major helps graduates obtain the skills necessary to analyze, design, and manage air pollution control, water supply, waste water treatment, solid waste handling, and hazardous waste systems. A thorough background in engineering fundamentals is provided by a broad core of courses in basic science and mathematics emphasizing sciences such as chemistry and microbiology.

A sequence of environmental engineering design courses distinguishes the undergraduate program. In the senior year, a majority of the environmental engineering courses, such as Solid Waste Management, Treatment Plant Design, Hydraulic Design, and Hazardous Waste Management, utilize a team approach to meet project design objectives. These courses also emphasize written and oral communication of engineering concepts and project results. There is a considerable emphasis on conservation, reuse, and pollution prevention as pollution control strategies in these courses.

Environmental Engineering students are qualified to take the Fundamentals of Engineering (FE) examination leading to certification as an Engineer-in-Training (EIT) and, with appropriate experience after graduation, sit for the Principles and Practice of Engineering (PE) examination leading to registration as a Professional Engineer. They are also qualified to pursue graduate education in Environmental Engineering or other related majors such as Environmental Pollution Control. ENVE graduates are qualified to work at the entry level in a variety of jobs related to environmental protection and management in government and private industry.

For a B.S. degree in Environmental Engineering, a minimum of 132 credits is required.

ENTRY TO MAJOR REQUIREMENTS: A 2.00 or higher cumulative grade-point average is required.

GENERAL EDUCATION: 45 credits
(21 of the 45 credits are included among the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 0-3 credits

REQUIREMENTS FOR THE MAJOR: 105-110 credits
(This includes 21 credits of General Education courses: 3 credits of GWS courses; 9 credits of GN courses; 3 credits of GS courses; 6 credits of GQ courses.)

PRESCRIBED COURSES (77 credits)
CHEM 012 GN(3), CHEM 014 GN(1), CHEM 013 GN(3), CHEM 015 GN(1), ED&G 100(3) (Sem: 1-2)
MATH 140 GQ(4), MATH 141 GQ(4), PHYS 211 GN(4) (Sem: 1-2)
ENGL 202C GWS(3) (Sem: 1-4)
PHYS 212 GN(4) (Sem: 3-4)
E MCH 011(3), E MCH 012(3) (Sem: 3-6)
CHM 301(3)[1], ENVE 301W(3), GEOSC 303(3), M E T 433(3), C ENG 302(2), M ENG 322(3) (Sem: 5-6)
ENVE 401(1), ENVE 415(3), ENVE 417(3), ENVE 424(3)[1], ENVE 425(3), ENVE 441(4)[1], ENVE 442(4)[1], ENVE 470(3)[1] (Sem: 7-8)

ADDITIONAL COURSES (25-30 credits)
Select 3-4 credits from CMPSC 201 GQ(3) or CSE 103 GQ(4) (Sem: 1-2)
Select 3 credits from ECON 002 GS(3) or ECON 004 GS(3) (Sem: 1-2)
Select 1-3 credits from SSET 295(1), SSET 395(1-3), or SSET 495(1-3) (Sem: 3-4)
Select 3 credits from C ENG 322(3) or E MCH 013(3) (Sem: 2-6)
Select 3 credits from CHEM 034(3) or CHEM 038(3) (Sem: 3-4)
Select 3-4 credits from E E 220(3) or E E T 320(4) (Sem: 4-5)
Select 3 credits form MATH 250(3) or MA SC 440(3) (Sem: 3-5)
Select 3-4 credits from MA SC 422(3) or STAT 200 GQ(4) (Sem: 5-6)
Select 3 credits from C E 360(3) or C ENG 361(3)[1] (Sem: 5-6)

SUPPORTING COURSES AND RELATED AREAS (3 credits)
Select 3 credits from the following areas: C E, C E T, E E, E E T, M E, M E T, I E, C ENG, E ENG, I ENG, MATH, CMPSC, COMP, CSE, M ENG, STAT (Sem: 5-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

ENVIRONMENTAL AND RENEWABLE RESOURCE ECONOMICS

College of Agricultural Sciences

This major is intended intended for students concentrating their studies on how economics is used to examine and solve environmental and renewable resource problems. Required courses develop a foundation in economics, other social sciences, and the environmental sciences.

Graduates find employment as environmental economists, resource economists, or policy specialists with environmental sections of large businesses, consulting firms, state and federal environmental protection and resource management agencies, and nongovernmental environmental resource organizations.

For the B.S. degree in Environmental and Renewable Resource Economics, a minimum of 121 credits is required.

GENERAL EDUCATION: 45 credits
(22-23 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 13-16 credits

REQUIREMENTS FOR THE MAJOR: 82-85 credits
(This includes 22-23 credits of General Education courses: 7-8 credits of GN courses; 6 credits of GQ courses; 6 credits of GS courses; 3 credits of GWS courses.)

PRESCRIBED COURSES (40 credits)
AG BM 101 GS(3)[1], MATH 110 GQ(4), MATH 111 GQ(2) (Sem: 1-2)
CHEM 012 GN(3), CHEM 014(1) (Sem: 1-2)
ECON 004 GS(3), R SOC 011 GS(3) (Sem: 1-4)
AG EC 201(3)[1], ECON 302 GS(3)[1] (Sem: 3-4)
ECON 304 GS(3) (Sem: 5-6)
AG EC 431W(3)[1], AG EC 429(3)[1], E R M 411(3), ECON 428(3)[1] (Sem: 5-8)

ADDITIONAL COURSES (24-27 credits)
BI SC 003 GN(3); or BIOL 011 GN(3), BIOL 012 GN(1) (Sem: 1-2)
CMPSC 101 GQ(3) or CMPSC 203 GQ(4) (Sem: 3-4)
ENGL 202A GWS(3), ENGL 202C GWS(3), or ENGL 202D GWS(3) (Sem: 5-6)
ECON 390(3) or STAT 460(3) (Sem: 3-8)
STAT 200 GQ(4), STAT 250 GQ(3), or AG 400(4) (Sem: 3-8)
Select 9 credits from AG EC 307(3), AG BM 338(3), AG EC 403(3), AG BM 407(3), AG BM 420(3), AG EC 450 GI(3), ECEEM 491(3), ECON 443(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (18 credits)
Select 6-9 credits in environmental science from department list (Sem: 3-8)
Select 6-9 credits in environmental social science from department list (Sem: 3-8)
Select 3 credits of methods in environmental science or social science from department list (Sem: 3-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

ENVIRONMENTAL RESOURCE MANAGEMENT

College of Agricultural Sciences

Environmental Resource Management (E R M) is an interdisciplinary, interdepartmental program in the College of Agricultural Sciences. Students may major or minor in E R M. The major is a science-based curriculum designed to prepare students for environment-oriented careers in the public and private sectors and for graduate school.

The E R M curriculum is three-tiered, beginning with a broad foundation of course work in communications and the biological, physical and social sciences. In subsequent courses, topical issues associated with the management and sustainability of the environment are addressed from a scientific, social and political perspective. Courses include ecosystem management, environmental law, pollutant impacts, resource economics, soil characterization, systems analysis and water management. The third tier affords the opportunity to specialize. Students select a minor or choose a group of courses (totaling at least 18 credits) that focus on a particular aspect of the environment. Examples include ecology, energy and air pollution control, environmental education, environmental geography, environmental health, environmental toxicology, resource economics and policy, soil resources, and water resources. Courses and minors from across the University can be used in developing a student's area of specialization.

For the B.S. degree in Environmental Resource Management, a minimum of 121 credits is required.

GENERAL EDUCATION: 45 credits
(30 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 106-108 credits
(This includes 30 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 6 credits of GS courses; 9 credits of GWS courses.)

PRESCRIBED COURSES (63 credits)
AG 150S(2), CAS 100 GWS(3), ENGL 015 GWS(3), E R M 151(1)[1] (Sem: 1-2)
CHEM 012 GN(3)[1], CHEM 013 GN(3)[1], CHEM 014 GN(1)[1], CHEM 034(3)[1] (Sem: 1-4)
BIOL 110 GN(4)[1], BIOL 220W GN(4)[1], SOILS 101 GN(3)[1], STAT 240(3) (Sem: 3-4)
AG BM 200(3), AG EC 201(3)[1], A S M 327(3)[1], GEOG 121 GS(3), GEOSC 303(3) (Sem: 5-6)
ENGL 202C GWS(3), E R M 300 (3)[1], E R M 411(3)[1] (Sem: 5-8)
E R M 412(3)[1], E R M 413W(3)[1] (Sem: 7-8)

ADDITIONAL COURSES (19-21 credits)
MATH 110 GQ(4), MATH 111 GQ(2); or MATH 140 GQ(4), MATH 141 GQ(4) (Sem: 1-2)
AG BM 101 GS(3) or ECON 002 GS(3) (Sem: 1-2)
PHYS 211 GN(4) or PHYS 250 GN(4) (Sem: 3-4)
Select 6 credits from E R M 430(3)[1], E R M 431(3)[1], E R M 432(3)[1], or E R M 433(3)[1] (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (24 credits)
Select 3 credits in ecology (Sem: 5-6)
Select 18 credits of technical courses in consultation with adviser (Sem: 5-8)
Select 3 credits in communications (Sem: 7-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

ENVIRONMENTAL SOIL SCIENCE

College of Agricultural Sciences

This major prepares students for positions with private firms that evaluate soils for various uses, delineate wetlands, perform environmental and hydrological assessments, and identify and remediate contaminated soils. It also prepares students for positions with the Natural Resource Conservation Service, the Pennsylvania Department of Environmental Protection, and Soil and Water Conservation Districts.

Students take courses in soils, hydrogeology, and the environment, with flexibility to specialize in geotechnical soils, biological applications, nutrient management, environmental management, soil conservation, geographic information systems, soil survey, engineering, soil geology, or in any area represented by an official university minor. Most students participate in soil judging contests held twice a year at various locations across the United States.

For the B.S. in Environmental Soil Science, a minimum of 120 credits is required.

GENERAL EDUCATION: 45 credits
(18 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 2-7 credits

REQUIREMENTS FOR THE MAJOR: 86-91 credits
(This includes 18 credits of General Education courses: 6 credits of GQ courses; 9 credits of GN courses; 3 credits of GS courses.)

PRESCRIBED COURSES (36 credits)
CHEM 012 GN(3), CHEM 013 GN(3), CHEM 014 GN(1), CHEM 015 GN(1) (Sem: 1-2)
SOILS 100(1), SOILS 101 GN(3)[1], SOILS 190(1) (Sem: 1-6)
SOILS 401(3)[1], SOILS 412W(3), SOILS 415(3)[1], SOILS 416(3)[1] (Sem: 3-6)
E R M 426(1), GEOSC 452(3), SOILS 420(3), SOILS 450(3), SOILS 490(1) (Sem: 5-8)

ADDITIONAL COURSES (32-37 credits)
MATH 110 GQ(4) or MATH 140 GQ(4) (Sem: 1-2)
PHYS 201 GN(4) or PHYS 250 GN(4) (Sem: 1-2)
AG BM 101 GS(3), ECON 002 GS(3), ECON 004 GS(3), or ECON 014 GS(3) (Sem: 1-2)
BIOL 027 GN(3) or BIOL 110 GN(4) (Sem: 1-4)
GEOSC 001(3) or GEOSC 071(3) (Sem: 1-4)
CHEM 034(3) or CHEM 038(4) (Sem: 3-4)
AGRO 028(3), BIOL 220W GN(3), FOR 203(4), HORT 101(3), or TURF 235(3) (Sem: 3-6)
STAT 200 GQ(4), STAT 240 GQ(3), or STAT 250 GQ(3) (Sem: 3-6)
AG 301W(3) or E R M 411(3) (Sem: 3-8)
SOILS 402(3)[1] or SOILS 419(3 or 4)[1] (Sem: 3-8)

SUPPORTING COURSES AND RELATED AREAS (18 credits)
Select 18 credits for specialization from department list. Courses may not be used to satisfy this requirement if used elsewhere in the major. (Sem: 1-8)
NOTE: Additional courses may be needed to meet American Registry of Certified Professionals in Agronomy Crops and Soils (ARCPACS) certification or to prepare for some graduate program specialties.
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

ENVIRONMENTAL STUDIES

Altoona College

This interdisciplinary major is is designed to provide students with an integrated and critical knowledge of the natural environment and human interactions with it. Students will receive a strong foundation in the natural sciences but will extend their studies across several disciplines, emphasizing both public policy issues and the role of the natural environment in history and culture. The goal of the program is "ecological literacy," which means that students will develop a broad-based understanding and awareness of environments and environmental issues, and they will develop the problem-solving skills to address those issues. Program requirements include interdisciplinary courses in environmental studies and a broad array of courses in biology, geology, chemistry, geography, economics, political science, English, history, and philosophy. By selecting appropriate electives to supplement the "additional courses" requirement of the major, students may develop an emphasis in either a specific field (i.e., biology, English) or in a general area of study (natural science, social science, and humanities). Graduates are equipped for employment as environmental consultants in business or with governmental agencies and public interest groups. Many may go on to postgraduate study in environmental science, public policy, or the humanities, or to law school.

A student wishing to transfer into the Environmental Studies program must have completed the following course ENVST 100(3) and have received a grade of C or better in the course.

For the B.A. degree in Environmental Studies, a minimum of 125 credits is required.

GENERAL EDUCATION: 45 credits
(21 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 17 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 60 credits [1]
(This includes 21 credits of General Education courses as follows: 3 credits of GH courses; 9 credits of GN courses; 3 credits of GQ courses; 6 credits of GS courses.)

PRESCRIBED COURSES (42 credits)
BIOL 110 GN(4), BIOL 220W GN(4), ENVST 100(3), ENGL 180 GH(3), GEOSC 020 GN(3) (Sem: 1-2)
CHEM 102(3), CHEM 104(1), ENVST 200(3), GEOG 115 GN(3) (Sem: 3-4)
STAT 250 GQ(3), ECON 428(3), HIST 453 or GEOG 407(3), PHIL 403(3) (Sem: 5-6)
ENVST 400W(3) (Sem: 7-8)

ADDITIONAL COURSES (18 credits)
ECON 002 GS(3) or ECON 004 GS(3) (Sem: 1-2)
PL SC 135 GS(3) or PL SC 425(3) (Sem: 5-6)
Select 3 credits of ENVST 395(1-18) or ENVST 496(1-18) (Sem: 7-8)
Select 9 credits (3 in each area listed below) in consultation with an academic adviser.
At least six credits must be at the 400-level.
a. Natural Sciences: BIOL 240W(4), BIOL 417(3), BIOL 427(3), BIOL 435(3), BIOL 446(3) BIOL 450W(5), ENVST 497(3), FOR 308(3), FOR 430/WFS 430(3), GEOSC 303(3), GEOSC 340(3), GEOSC 462(3), MICRB 400(3), WFS 408(3) (Sem: 3-8).
b. Social Sciences: ANTH 040(3), ANTH 146 GS;GI(3), ANTH 152(3), ANTH 456(3), ANTH/BIO 464(3), ENVST 497(3), GEOG 401(3), GEOG 406(3), PL SC 412(3), PL SC 420(3), PL SC 444(3), S T S 047(3) (Sem: 3-8)
c. Arts and Humanities: ENGL 404(3), ENGL 412(3), ENGL 415(3), ENGL 416(3), ENGL 421(3), ENGL 430(3), ENVST 497(3), HIST/S T S 151(3), HIST 428/S T S(3); When topic appropriate and with program approval: ENGL 400(3), ENGL 401(3), ENGL 483(3), HIST 200(3), HIST 497(3) (Sem: 3-8)
Other courses may be substituted with program approval.
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

ENVIRONMENTAL SYSTEMS ENGINEERING

College of Earth and Mineral Sciences

The Environmental Systems Engineering program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET). It is an interdisciplinary program concerned with the impact of industrial activities on the environment and the choice of cost-effective remediation strategies. The program is unique as it is designed to address critical environmental problems of the basic industries such as those involved in the extraction, conversion, and utilization of energy and mineral resources. The courses are sequenced so that students acquire an appropriate blend of theory, applications, and design and are equipped with the fundamentals necessary to maintain lifelong professional growth. Graduates are prepared to enter both the private and public sectors as environmental systems engineers or to pursue further education at the graduate level.

During the first two years, the program shares many common features (e.g., mathematics, chemistry, physics, and engineering mechanics) with other more traditional engineering disciplines. Students then take a series of special courses that introduce engineering concepts in the extractive and process industries. Process engineering and a variety of solid-solid, solid-fluid, and fluid–fluid separations play a major and often dominant role in the prevention and/or remediation of environmental damage resulting from industrial activity. Students then specialize in the particular problems associated with air, land, or water or select a hybrid program. Specialization is accomplished through a combination of additional designated courses and selection from an extensive list of relevant elective courses, which may include a senior thesis. The curriculum is structured so as to integrate design concepts into the various subject areas covered in the program.

The human, societal, economic, ethical, and regulatory aspects of the industrial impact on the environment are addressed through a combination of specific courses and components of other more general courses. This aspect of the program is designed to provide students with a deeper understanding, both of the impact of environmental degradation on society and of the effects on industrial activity of society's demands for protection of the environment. The program culminates with the capstone design course, which is an integrated, problem-based, multi-faceted project in which students, working in a team setting, utilize fundamental concepts to design an environmental remediation system.

The integration of knowledge and skills acquired during the course of study enables graduates of Penn State's Environmental Systems Engineering program to:

—Enter the private or public sectors as environmental systems engineers to solve a broad range of environmental problems associated with the process industries or pursue an advanced degree.

—Address critical environmental problems of the basic industries, especially those involved with the extraction, conversion, and utilization of energy and mineral resources; design engineering systems to alleviate such problems, individually and in a team setting; and communicate the results effectively.

—Determine the impact of environmental pollution control on the viability of industrial operations, including health and safety, social, and ethical aspects; evaluate novel strategies for minimizing pollution control costs in the process industries.

—Recognize the need to maintain professional competency and the value of life-long learning.

For the B.S. degree in Environmental Systems Engineering, a minimum of 130 credits is required.

GENERAL EDUCATION: 45 credits
(27 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 112-113 credits
(This includes 27 credits of General Education courses: 9 credits of GWS courses; 6 credits of GQ courses; 9 credits of GN courses; 3 credits of GS courses.)

PRESCRIBED COURSES (86 credits)
EM SC 100S GWS(3)[71] (Sem: 1-2)
CHEM 012 GN(3), CHEM 013 GN(3), CHEM 014 GN(1), CHEM 034(3), E MCH 011(3), E MCH 012(3), GEOG 030 GS(3), MATH 140 GQ(4), MATH 141 GQ(4), MATH 251(4), PHYS 211 GN(4), PHYS 212 GN(4), MICRB 106(3) (Sem: 1-4)
C E 370(3)[1], EGEE 301(5), GEOSC 071(3)[1] (Sem: 3-6)
ENGL 202C GWS(3)[1], F SC 430(3), GEOSC 452(3), MNG 401(1), MN PR 301(3)[1], P N G 411(1) (Sem: 5-6)
ECEEM 484W(3), GEOEE 402(1), GEOEE 404(2), GEOEE 406(3), GEOEE 412(1), GEOEE 427(3)[1], GEOEE 480(3) (Sem: 5-8)

ADDITIONAL COURSES (17-18 credits)
ENGL 015 GWS(3) or ENGL 030 GWS(3) (Sem: 1-2)

CMPSC 201C GQ(3), CMPSC 201F GQ(3), or CMPSC 203 GQ(4) (Sem: 3-4)
MATH 220 GQ(2) or MATH 231(2) (Sem: 3-4)
GEOSC 413W(3), SOILS 401(3), or METEO 455(3) (Sem: 6-8)
METEO 454(3), MN PR 401(3), or MN PR 426(3) (Sem: 7-8)
GEOEE 408(3), M E 470(3), or MN PR 425(3) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 9 credits in consultation with adviser (Sem: 7-8)
(Students may apply up to 6 credits of ROTC.)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
[71] The following substitutions are allowed for students attending campuses where the indicated course is not offered: CAS 100 GWS or ENGL 202C GWS can be substituted for EM SC 100S GWS.

FILM AND VIDEO

College of Communications

This major is designed to serve students whose major interest is the art of film and video practice. It serves students with professional objectives in the film, television, or related industries, as well as students planning to continue work in film and video on the graduate level.

The major includes a broad liberal arts background with introductory courses in the areas of film and video. It provides a balanced, professionally oriented course of study that combines film/video production, directing, and screenwriting with history, criticism, and theory. Students have the flexibility to pursue an area of emphasis within the major (screenwriting, direction, production).

Students must select at least 80 credits in courses outside the College of Communications, including at least 65 in the liberal arts and sciences.

For the B.A. degree in Film and Video, a minimum of 120 credits is required.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in ELECTIVES)

ELECTIVES: 18 credits

COLLEGE OF COMMUNICATIONS BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 33 credits[1]

PRESCRIBED COURSES (18 credits)
COMM 150 GA(3) (Sem: 1-2)
COMM 242(3), COMM 250 GA(3) (Sem: 3-4)
COMM 337(3), COMM 346(3), COMM 347(3) (Sem: 3-6)

ADDITIONAL COURSES (15 credits)
Select 12 credits from COMM 345(3), COMM 437(3), COMM 438(3), COMM 439(3), COMM 440(3), COMM 445(3), COMM 446(3), COMM 447(3), COMM 449(1-6), COMM 450(3) (Sem: 5-8)
Select 3 credits from COMM 451(3), COMM 452(3), COMM 453(3), COMM 454(3-6), or COMM 455(3-6) (Sem: 7-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

FINANCE

Smeal College of Business

This major provides students with an opportunity to study investment analysis, management of banks and other financial institutions, and financial management of corporations and other businesses. Course coverage includes business finance, security markets, commercial bank management, investment valuations, portfolio management, futures and options markets, and capital budgeting.

For the B.S. degree in Finance, a minimum of 120 credits is required (at least 15 credits must be taken at the 400 level).

GENERAL EDUCATION: 45 credits
(15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 12-14 credits

REQUIREMENTS FOR THE MAJOR: 76-78 credits
(This includes 15 credits of General Education courses: 3 credits of GWS courses; 6 credits of GQ courses; and 6 credits of GA, GH, or GS courses.)

PRESCRIBED COURSES (37 credits)
ACCTG 211(4), CMPSC 203 GQ(4), ECON 002 GS(3), ECON 004 GS(3) (Sem: 1-4)
B A 301(2), B A 302(2), B A 303(2), B A 304(2), B A 411(3), ENGL 202D GWS(3), FIN 305W(3)[1], FIN 406(3)[1], FIN 408(3)[1] (Sem: 5-6)

ADDITIONAL COURSES (20-22 credits)
MATH 110 GQ(4) or MATH 140 GQ(4) (Sem: 1-2)
MS&IS 200(4) or STAT 200(4) (Sem: 1-2)
M I S 204(2) or IST 110(4) (Sem: 3-4)
B A 243(4), or B A 241(2) and B A 242(2) (Sem: 3-4)
Select 6 credits[1] from FIN 405(3), FIN 407(3), FIN 409(3), FIN 410(3), or FIN 412(3) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (19 credits)
Select 4 credits: Attainment of 12th credit level proficiency in a single foreign language. Proficiency must be demonstrated by either examination or course work. (Sem: 1-4)
Select 6 credits of Global Awareness and Understanding from approved course list (credits must be taken in GA, GH, or GS). (Sem: 1-8)
Select 3 credits of related course work. See Department List. (Sem: 5-8)
Select 6 credits of supporting course work. See Department List. (Sem: 5-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

FINANCE

Capital College

This major is designed for students seeking careers in corporate finance, investment finance, banking, public finance, and international finance, as well as for those who intend to pursue graduate study in finance. The graduates may then be prepared to seek certificates in financial analysis (CFA) and financial planning (CFP). Each student's background is complemented with basic business instruction in accounting, marketing, and information systems. With business and non-business electives, the program is designed to develop necessary skills to be an effective financial manager. Because the Harrisburg area is the center of industry and economic development for south-central Pennsylvania, students are provided with many opportunities to experience the world of business.

For a B.S. degree in Finance, a minimum of 122 credits is required. At least 50 percent of the business credit hours required for the degree must be taken at Capital College. No more than 61 credits should be from business and business-related courses.

ENTRY TO MAJOR REQUIREMENTS: Entry to the Finance major requires the completion of 9 entry-to-major courses: ENGL 015 GWS(3) or ENGL 030 GWS(3), MATH 110 GQ(4) or MATH 140 GQ(4), ACCTG 211(4), CMPSC 203 GQ(4) or M I S 103(3), M I S 204(2), STAT 200 GQ(4) or MS&IS 200(4), ECON 002 GS(3), ECON 004 GS(3), B A 243(4) and a 2.00 or higher cumulative grade-point average. Additional information about this major is available in the office of the Director of Undergraduate Studies, School of Business Administration at Penn State Harrisburg.

GENERAL EDUCATION: 45 credits
(10-12 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education Course Requirements in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: Select 6-7 credits of non-business courses.

REQUIREMENTS FOR THE MAJOR: 81-84 credits
(This includes 10-12 credits of General Education Courses: 3 credits of GWS course; 3 credits of GS course; 4-6 credits of GQ courses)

PRESCRIBED COURSES (46 credits)
ENGL 202D GWS(3), ECON 002 GS(3), ECON 004 GS(3), ACCTG 211(4), M I S 204(2), B A 243(4) (Sem: 1-4)
FINAN 320(3)[1], BUS 361(3), BUS 364W GI(3), BUS 462(3), INFSY 390(3) (Sem: 5-8)
MNGMT 310(3), MRKT 370(3), ECNMS 313(3)[1], FINAN 410(3)[1] (Sem: 5-8)

ADDITIONAL COURSES (23-24 credits)
Select 4 credits from MATH 110 GQ(4) or MATH 140 GQ(4) (Sem: 1-4)
Select 3-4 credits from M I S 103(3) or CMPSC 203 GQ(4) (Sem: 1-4)
Select 4 credits from from MS&IS 200(4) or STAT 200 GQ(4) (Sem: 1-4)
Select 12 credits[1] from the following: FINAN 421(3), FINAN 422(3), FINAN 424(3) FINAN 426(3), FINAN 427(3) FINAN 428(3), FINAN 430(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 12 credits from 200-400 level business courses from: ACCT, BUS, ECNMS, FINAN, INFSY, MNGMT, or MRKT in consultation with an academic adviser and in support of the student's interests. (Sem: 3-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

FINANCE

Penn State Erie, The Behrend College

The Finance major is a unique program that provides the student with a firm foundation in the principles of finance and its major areas: financial management, investments, and financial markets. The course work is designed to lead to professional certification in financial analysis. Students have job opportunities in a variety of positions with mutual funds, brokerage firms, banks, and insurance companies, as well as positions in corporate finance.

The program provides students with the depth and breadth of knowledge necessary to prepare them for Level I of the Chartered Financial Analysts (CFA) Exam. The rigorous curriculum, including courses in finance, accounting, and economics, is based on the CFA Body of Knowledge developed through surveys of professionals involved in the practice of investment management. Students will be encouraged to take Level I of the CFA exam after graduation.

For the B.S. degree in Finance, 123 credits are required. Each student must earn at least a grade of C in each 300- and 400-level course in the major field.

GENERAL EDUCATION: 45 credits
(15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of this Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 1 credit

REQUIREMENTS FOR THE MAJOR: 92 credits
(This includes 15 credits of General Education courses: 6 credits of GQ courses; 6 credits of GS courses; 3 credits of GWS courses.)

PRESCRIBED COURSES (64 credits)
CMPSC 203 GQ(4) (Sem: 1-2)
ACCTG 211(4), B A 243(4), ECON 002 GS(3), ECON 004 GS(3), ENGL 202D GWS(3), M I S 204(2), MSIS 200(4) (Sem: 3-4)
ACNTG 310(4)[1], ACNTG 426(3)[1], FNC 300(3)[1], FNC 400(3)[1], FNC 410(3)[1], FNC 460(3)[1], FNC 470(3)[1], FNC 480(3)[1], MANGT 300(3)[1], MANGT 310(3)[1], MRKTG 300(3)[1] (Sem: 5-6)
MANGT 47OW(3)[1] (Sem: 7-8)

ADDITIONAL COURSES (7 credits)
MATH 110 GQ or MATH 140 GQ(4) (Sem: 1-2)
Select 3 credits from: ECON 304(3)[1], ECNS 420(3)[1], ECNS 450(3)[1], ECNS 460(3)[1], or ECNS 485(3)[1] (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (21 credits)
Select 15 credits from one of the non-business supporting course areas (see school list of approved courses). See the Admission section of the general information in the front of this Bulletin for the placement policy for Penn State foreign language courses. (Sem: 1-8)
Select 6 credits from FNC or other business areas (see school list of approved courses). (Sem: 5-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

FOOD SCIENCE

College of Agricultural Sciences
Food science involves the application of science and technology to food product manufacture, storage, and distribution to consumers. Food scientists are especially concerned with food safety, nutritional values, managing food quality, food plant management, and development of new products and processes. They are employed by manufacturers and distributors of food products; by chemical, packaging, and other industries that supply goods and services; by colleges and universities in teaching and research; and by government agencies concerned with food regulations and the health and well-being of the general public.

Students must complete at least one 3-credit writing-intensive course, selected from "W" courses offered in the major or college of enrollment, and 3 credits of Intercultural and International Competence courses prior to graduation.

For the B.S. degree in Food Science, a minimum of 130 credits is required.

GENERAL EDUCATION: 45 credits
(18 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 10 credits

REQUIREMENTS FOR THE MAJOR: 93 credits
(This includes 18 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GWS courses.)

PRESCRIBED COURSES (66 credits)
BIOL 011 GN(3), BIOL 012 GN(1), CHEM 012 GN(3), CHEM 013 GN(3), CHEM 014 GN(1), CHEM 015 GN(1) (Sem: 1-2)
B M B 101(3), FD SC 200(3)[1], FD SC 201(1)[1], MICRB 201(3), MICRB 202(2), PHYS 250 GN(4) (Sem: 3-4)
A S M 425(3)[1], B M B 102(1), FD SC 400(3)[1], FD SC 402(1), FD SC 406(3)[1], FD SC 408(2)[1], FD SC 409W(3)[1], FD SC 410(3)[1], STAT 250 GQ(3) (Sem: 5-6)
FD SC 411(2), FD SC 413(3), FD SC 414(4), FD SC 415(3), FD SC 430(3), FD SC 490(1) (Sem: 7-8)

ADDITIONAL COURSES (13-15 credits)
MATH 110 GQ or MATH 140 GQ(4) (Sem: 1-2)
CHEM 034(3), CHEM 035(3); or CHEM 036(2), CHEM 038(4), CHEM 040(2) (Sem: 3-4)
ENGL 202C GWS or ENGL 202D GWS(3) (Sem: 5-6)

SUPPORTING COURSES AND RELATED AREAS (12-14 credits)
To reflect the student's career interests, select 12-14 credits from department list or in consultation with adviser (Sem: 5-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

FOREST SCIENCE

College of Agricultural Sciences
The mission of the B.S. program in Forest Science is to help students develop the knowledge, skills, and professional ethics for understanding and managing forest ecosystems and living as responsible members of society.

The Forest Science major provides for the education necessary for students to pursue professional careers in one of the following options: (1) Forest Biology, (2) Forest Management, (3) Urban Forestry, and (4) Watershed Management. These options also will help prepare students for graduate studies in continuing professional education.

For the B.S. degree in Forest Science, a minimum of 129 credits is required for the Forest Biology, Forest Management, and Urban Forestry options, and a minimum of 130 credits for the Watershed Management option. Students should be aware that completion of the Forest Science degree in four years requires enrollment at the University Park campus beginning the fall semester of the sophomore year.

FOREST BIOLOGY OPTION: This option provides a strong background in the biological and ecological aspects of contemporary forestry and establishes a sound foundation for professional employment and graduate-level study in forest and environmental sciences.

FOREST MANAGEMENT OPTION: This option provides professional training in the management of forest lands consistent with the needs of ownership objectives. Employment opportunities include forest management positions with public agencies, industry, and private consulting.

URBAN FORESTRY OPTION: This option helps prepare students to manage community trees and green spaces. It emphasizes technical expertise, communication abilities, and skills for working with diverse people. Employment opportunities include municipalities, arboricultural companies, utilities, and government agencies.

WATERSHED MANAGEMENT OPTION: This option focuses on water resources and the integrated management of natural resources with emphasis on water. Graduates qualify for federal employment as hydrologists and for water-related careers in municipal watershed management, state and local government, and environmental/engineering consulting.

GENERAL EDUCATION: 45 credits
(21 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 1-5 credits

REQUIREMENTS FOR THE MAJOR: 101-104 credits
(This includes 21 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses; 3 credits of GWS courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 41-43 credits

PRESCRIBED COURSES (29 credits)
BIOL 110GN(4), CHEM 012 GN(3), CHEM 014 GN(1), ECON 002 GS(3) (Sem: 1-2)
FOR 200W(3), FOR 203(2)[1], SOILS 101 GN(3), STAT 240 GQ(3), W P 203(1)[1] (Sem: 3-4)
ENGL 202C GWS(3), FOR 308(3)[1] (Sem: 5-6)

ADDITIONAL COURSES (10 credits)
CAS 211(3), CAS 213(3), CAS 250(3), or CAS 352(3) (Sem: 5-6)
MATH 110 GQ(4), MATH 140 GQ(4), or MATH 140B GQ(4) (Sem: 1-2)
AEE 440(3), ENGL 215(3), ENGL 416(3), ENGL 418(3), or ENGL 419(3) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (2-4 credits)
Select a minimum of 2 credits from the following list of courses: AG 200A(2), AG 200B(2), CMPSC 100(3), CMPSC 101 GQ(3), or CMPSC 203 GQ(4) (Sem: 3-4)

REQUIREMENTS FOR THE OPTION: 60-61 credits

FOREST BIOLOGY OPTION: 60 credits

PRESCRIBED COURSES (45 credits)
BIOL 240W GN(4) (Sem: 1-2)
CHEM 034(3) (Sem: 3-4)
FOR 204(2), FOR 320(2), FOR 350(3), FOR 366(4)[1] (Sem: 3-6)
PPATH 318(2), ENT 313(2), W F S 209(3) (Sem: 5-6)
FOR 409(2), FOR 410(3), FOR 421(3)[1], FOR 430(3), FOR 475(3)[1], FOR 480(3), FOR 494(3) (Sem: 5-8)

ADDITIONAL COURSES (6 credits)
AG BM 200(3) or MGMT 100(3) (Sem: 5-6)
FOR 455 or GEOG 352(3) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 9 credits in consultation with adviser (Sem: 5-8)

FOREST MANAGEMENT OPTION: 60 credits

PRESCRIBED COURSES (39 credits)
FOR 204(2), FOR 320(2), FOR 350(3), FOR 366(4)[1] (Sem: 3-6)

PPATH 318(2), ENT 313(2), W F S 209(3) (Sem: 5-6)
FOR 421(3)[1], FOR 440(3), FOR 455(3), FOR 466W(3)[1], FOR 470(3), FOR 475(3), FOR 480(3) (Sem: 5-8)

ADDITIONAL COURSES (9 credits)
Select a minimum of 3 credits from GEOG 110 GN(3), GEOG 115 GN(3), GEOSC 002 GN(3), METEO 003 GN(3), PHYS 150 GN(3), PHYS 250 GN(4) (Sem: 3-4)
AG BM 200(3) or MGMT 100(3) (Sem: 7-8)
FOR 401(3) or FOR 416(3) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
In consultation with adviser, select 12 credits from department list approved for the option (Sem: 5-8)

URBAN FORESTRY OPTION: 60 credits

PRESCRIBED COURSES (33 credits)
BIOL 240W GN(4) (Sem: 1-2)
PPATH 318(2), ENT 313(2), FOR 204(2), FOR 350(3), FOR 366(4)[1], FOR 421(3), FOR 480(3) (Sem: 3-4)
FOR 401(3)[1], HORT 138(3), HORT 408(4) (Sem: 5-8)

ADDITIONAL COURSES (3 credits)
FOR 495(3)[1] or FOR 496(3)[1] (Sem: 5-6)

SUPPORTING COURSES AND RELATED AREAS (24 credits)
In consultation with adviser, select 24 credits from the following:
a. Select 3-6 credits from ENT 319(1), FOR 410(3), FOR 416(3), FOR 466W(3), FOR 470(3), and W F S 209(3) (Sem: 5-8)
b. Select 2-3 credits from E R M 430(3), FOR 409(2), and FOR 430(3) (Sem: 5-8)
c. Select 3 credits from A S M 217(3) and FOR 475(3) (Sem: 5-8)
d. Select 3-6 credits from GEOG 102 GH(3), LARCH 003 GA(3), LARCH 060 GA(3), and LARCH 127(3) (Sem: 5-8)
e. Select 3-6 credits from MGMT 100(3) or MGMT 341(3) and R SOC 305W(3) or R SOC 460(3) (Sem: 5-8)
f. Select 3-6 credits from B A 250(3), B LAW 243(3), and E R M 411(3) (Sem: 5-8)

WATERSHED MANAGEMENT OPTION: 61 credits

PRESCRIBED COURSES (40 credits)
CHEM 034(3), MATH 111 GQ(2), METEO 003 GN(3) (Sem: 1-2)
GEOSC 001(3), PHYS 250 GN(4), PHYS 251 GN(4) (Sem: 3-4)
A S M 327(3), BIOL 435(3)[1], GEOSC 452(3)[1], MICRB 400(2), SOILS 422(3) (Sem: 5-8)
FOR 410(3), FOR 470(3)[1], FOR 471(1) (Sem: 7-8)

ADDITIONAL COURSES (21 credits)
B LAW 243(3) or E R M 411(3) (Sem: 5-6)
PL SC 001 GS(3), PL SC 125(3), PL SC 417(3), or PL SC 419(3) (Sem: 5-6)
ECON 004 GS(3) or ECON 302 GS(3) (Sem: 5-6)
AG BM 200(3) or MGMT 100(3) (Sem: 5-6)
AG EC 201(3), AG EC 431W(3), AG EC 429(3), or ECON 428(3) (Sem: 7-8)
FOR 455(3), GEOG 352(3), or GEOG 454(3) (Sem: 7-8)
R SOC 417(3) or SOC 446(3) (Sem: 7-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

FRENCH, B.A.

College of the Liberal Arts

The B.A. major in French encourages students to develop fluency in the language as well as an appreciation of francophone literature and culture. The major can also help to prepare students for interdisciplinary professional careers in which a knowledge of a foreign language is useful. At present, the B.A. major in French is available either as a Language and Culture option or as a Language and Literature option.

For the B.A. degree in French, a minimum of 124 credits is required.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 18 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 37 credits[1]

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 19 credits

PRESCRIBED COURSES (19 credits)
FR 201(4), FR 202(3), FR 330(3), FR 351(3), FR 352(3) (Sem: 1-6)
FR 402W(3) (Sem: 5-8)

REQUIREMENTS FOR THE OPTION: 18 credits

LANGUAGE AND CULTURE OPTION: 18 credits

PRESCRIBED COURSES (12 credits)
FR 310(3) (Sem: 1-4)
FR 401(3), FR 416(3), FR 430(3) (Sem: 5-8)

ADDITIONAL COURSES (6 credits)
Select 6 credits in French literature at the 400 level (Sem: 5-8)

LANGUAGE AND LITERATURE OPTION: 18 credits

ADDITIONAL COURSES (18 credits)
Select 18 credits in French literature at the 400 level (Sem: 5-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

FRENCH, B.S.

College of the Liberal Arts
The B.S. degree is designed to allow students to combine fluency in French with other academic disciplines. The Business option develops basic skills in French (speaking, understanding, reading, writing) and acquaints students with a number of fields essential to business, especially in the international area. The Engineering option has a required overseas study and internship component. The Applied French option develops basic skills in French (speaking, understanding, reading, writing) as well as a basic knowledge of French literature and culture. At the same time, it provides a concentration in a professional area in which a command of French can be particularly relevant or useful. Courses in French culture and civilization are essential to all B.S. options, and students are encouraged to participate in the University's International Studies programs in France..

For the BS degree in French (all options) a minimum of 124 credits is required.

GENERAL EDUCATION: 45 credits
(0-13 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 13-24 credits

REQUIREMENTS FOR THE MAJOR: 61-75 credits[1]
(This includes 0-13 credits of General Education courses. For the French-Business option 0-4 credits of GQ courses; 6 credits of GS courses; 3 credits of GWS courses. For the Technical-Writing and Translation option 0-3 credits of GH courses; 3 credits of GWS courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 22 credits

PRESCRIBED COURSES (22 credits)
FR 201(4), FR 202(3), FR 330(3), FR 351(3), FR 352(3) (Sem: 1-6)
FR 401(3), FR 402W(3) (Sem: 5-8)

REQUIREMENTS FOR THE OPTION: 39-53 credits

FRENCH-BUSINESS OPTION: 53 credits
PRESCRIBED COURSES (43 credits)
FR 308(3), FR 310(3) (Sem: 1-2)
ACCTG 211(4), ECON 002 GS(3), ECON 004 GS(3), I B 303(3), MGMT 100(3) (Sem: 1-4)
ECON 333 GS(3), ENGL 202D GWS(3), FIN 100(3), FR 416(3), FR 430(3), I B 403(3), MKTG 221(3) (Sem: 5-8)

ADDITIONAL COURSES (4 credits)
MS&IS 200(4) or STAT 200 GQ(4) (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 3 credits in French literature (Sem: 5-8)
Select 3 credits in French at the 400 level (Sem: 5-8)

FRENCH-ENGINEERING OPTION: 39 credits
(Open only to students enrolled in an engineering major.)

PRESCRIBED COURSES (12 credits)
FR 308(3) (Sem: 3-8)
FR 430(3), FR 409(3), FR 416(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (27 credits)
Select 21 credits of engineering courses, including ENGR 295(1-3) and ENGR 395(1-3), in consultation with the engineering adviser (Sem: 3-8)
Select 3 credits in French literature at the 400 level (Sem: 5-8)
Select 3 credits in French at the 400 level (Sem: 5-8)
NOTE: All French-Engineering majors are required to participate in a one-semester engineering internship in France, arranged by the College of Engineering, during which up to 9 credits in French and up to 12 credits in engineering may be earned.

APPLIED FRENCH OPTION: 39 credits

PRESCRIBED COURSES (3 credits)
FR 430(3) (Sem: 5-8)

ADDITIONAL COURSES (6 credits)
FR 308(3) or FR 310(3) (Sem: 3-8)
FR 416(3) or FR 417(3) or FR 418(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (30 credits)
Select 18 credits in related areas such as Hotel, Restaurant, and Institutional Management; Linguistics; Sociology; Economics; Science, Technology and Society, or in another professional areas where competency in French is desirable. The courses are to be selected in consultation with an adviser. At least six credits of such courses must be at the 400 level. (Sem: 1-8)
Select 12 credits in French at the 400 level. (Sem: 5-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

GENERAL ARTS AND SCIENCES

Penn State Erie, The Behend College

In this interdisciplinary major students may pursue broad interests and develop their own specialized programs when their interests are not congruent with established programs. The B.A. degree in General Arts and Sciences can be a terminal degree, or students can prepare for graduate school, professional school, or employment in business, government, or industry.

The Liberal Studies option provides the most flexible undergraduate degree program in the University except for the Bachelor of Philosophy degree. Students can use the Liberal Studies option to structure a program of study around their individual interests and career plans and can develop background in areas where Penn State Erie, The Behrend College, does not currently offer majors.

For further information and a complete list of courses, contact the head of the Division of Humanities and Social Sciences.

For the B.A. degree in General Arts and Sciences, a minimum of 124 credits is required. Each student must earn at least a grade of C in each 300- and 400-level course in the major field.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)

INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in ELECTIVES or GENERAL EDUCATION course selection)

ELECTIVES: 19 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 36 credits

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 12 credits

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 3 credits in each of the areas of arts, humanities, science/mathematics, and the social and behavioral sciences (Sem: 1-8)

HUMANITIES OPTION: 24 credits

SUPPORTING COURSES AND RELATED AREAS (24 credits)
Select 24 credits in humanities from those listed under humanities in the Bachelor of Arts Degree Requirements list, with at least 3 credits in each of three areas, including 15 credits at the 400 level (Sem: 1-8)

LIBERAL STUDIES OPTION: 24 credits

SUPPORTING COURSES AND RELATED AREAS (24 credits)
[15 of these credits must be at the 400 level]
In this option, the student shall submit a proposal to the adviser listing his/her choice of subjects beyond those required in the Supporting Courses and Related Areas category. In consultation with the adviser and the General Arts and Sciences program head, the student may choose from any B.A. course offering of the University. Option must be approved no later than the end of the sixth semester. (Sem: 1-8)

SCIENCE/MATHEMATICS OPTION: 24 credits

SUPPORTING COURSES AND RELATED AREAS (24 credits)
Select 24 credits in science/mathematics from those listed under science/mathematics in the Bachelor of Arts Degree Requirements list, with at least 3 credits in each of three areas, including 15 credits at the 400 level (Sem: 1-8)

SOCIAL AND BEHAVIORAL SCIENCES OPTION: 24 credits

SUPPORTING COURSES AND RELATED AREAS (24 credits)
Select 24 credits in the social and behavioral sciences from those listed in the Bachelor of Arts Degree Requirements list, with at least 3 credits in each of three areas, including 15 credits at the 400 level (Sem: 1-8)

GEOGRAPHY

College of Earth and Mineral Sciences

Geographers describe, analyze, and explain patterns of physical and human phenomena on the Earth's surface. Geography is simultaneously an environmental science and a social-behavioral science. This major helps provide grounding in analytical techniques such as map reading, cartography, and statistics. Substantive course work investigates the ways people use environmental resources and how they arrange themselves and their economic, social, and political activities on the earth's surface.

The Geography major can provide preparation for a career in business, industry, or government. Geographers with bachelor's degrees are currently being placed in federal, state, and local administrative and planning agencies and in private firms that specialize in planning and development or in environmental and socioeconomic analysis.

For the B.S. degree in Geography, a minimum of 120 credits is required.

GENERAL OPTION: This option is designed to serve the needs of students who want to learn about the various topics and perspectives that comprise the discipline of geography. The General option is appropriate both for students who intend to pursue postgraduate degrees and for students who want to emphasize a topic for which no option exists.

GEOGRAPHIC INFORMATION SCIENCE OPTION: This option helps prepare students for entry-level positions in public and private mapping/remote sensing agencies and firms. The student may specialize in one or all of the areas covered in the option. This option is appropriate for students intending to pursue advanced degrees with specialization in these fields.

PHYSICAL/ENVIRONMENTAL GEOGRAPHY OPTION: This option is appropriate for students who want a broad understanding of the earth and environmental sciences in preparation for careers in industry, commerce, and government. The option is designed to develop competence in description, analysis, explanation, and management of problems arising from human use of natural resources and natural systems.

URBAN AND REGIONAL DEVELOPMENT OPTION: This option is appropriate for students who want to study urban and regional development, public policy, and other applications of urban, social, and economic geography in industrialized societies, applying geographical analysis to development opportunities and problems.

Geography courses satisfying the Intercultural and International Competence requirement: GEOG 040 GS;GI(3), GEOG 103 DF;GS(3), GEOG 128 DF;GS(3), GEOG 415W GI(3).

Geography courses satisfying the Writing requirement: GEOG 401W(3), GEOG 404W(3), GEOG 408W(3), GEOG 415W GI(3), GEOG 420W(3), GEOG 421W(3), GEOG 432W(3), GEOG 433W(3), and GEOG 440W(3). All students must satisfactorily complete at least one writing-intensive course in Geography.

GENERAL EDUCATION: 45 credits
(12 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 12-18 credits

REQUIREMENTS FOR THE MAJOR: 69-75 credits
(This includes 12 credits of General Education courses: 6 credits of GQ courses; 6 credits of GWS courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 54 credits

PRESCRIBED COURSES (18 credits)
EM SC 100S GWS(3)[71] (Sem: 1-2)
GEOG 010 GN(3)[1], GEOG 020 GS(3)[1], GEOG 030 GS(3)[1], GEOG 121 GS(3) (Sem: 1-4)
GEOG 454(3) (Sem: 5-6)

ADDITIONAL COURSES (24 credits)
ENGL 015 GWS(3) or ENGL 030 GWS(3) (Sem: 1-2)
GEOG 100 GS(3)[1] or GEOG 120 GS(3)[1] (Sem: 3-6)
Select 3 credits from: GEOG 105(3)[1], GEOG 110 GN(3)[1], or GEOG 115 GN(3)[1] (Sem: 3-6)
Select 3 credits from: GEOG 040 GS;GI(3), GEOG 103 GS;DF(3), GEOG 124 GS(3), or GEOG 128 GS;DF(3) (Sem: 3-6)
Select 3 credits from: GEOG 040 GS;GI(3), GEOG 102 GH(3), GEOG 200(3), GEOG 401W(3), GEOG 404W(3), GEOG 427(3), GEOG 440W(3), GEOG 441(3), GEOG 442(3), GEOG 443(3), GEOG 444(3), or GEOG 445(3) (Sem: 5-8)
Select 6 credits from: MATH 017 GQ(3), MATH 018 GQ(3), MATH 021GQ(3), MATH 022 GQ(3), MATH 026 GQ(3), MATH 040 GQ(5), MATH 041 GQ(3), MATH 110 GQ(4), MATH 111 GQ(2), MATH 140 GQ(4), MATH 140A GQ(6), or MATH 141 GQ(4) (Sem: 1-4)
Select 3 credits from: CMPSC 101 GQ(3), CMPSC 201 GQ(3), CSE 103 GQ(3), or GEOG 356(3) (Sem: 1-6)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 3 credits in quantification (Sem: 1-4)
Select 3 credits in natural sciences (Sem: 1-6)
Select 6 credits in social and behavioral sciences (Sem: 3-6)

REQUIREMENTS FOR THE OPTION: 15-21 credits

GENERAL OPTION: 15 credits

ADDITIONAL COURSES (15 credits)
Select 15 credits from 400-level GEOG courses (Sem: 5-8)

GEOGRAPHIC INFORMATION SCIENCE OPTION: 21 credits

PRESCRIBED COURSES (12 credits)
GEOG 321(3), GEOG 352(3) (Sem: 3-6)
GEOG 357(3), GEOG 455(3) (Sem: 5-8)

ADDITIONAL COURSES (9 credits)
Select 9 credits from GEOG 330(3), GEOG 356(3), GEOG 421(3), GEOG 422(3), GEOG 425(3), GEOG 437(3), GEOG 453(3), GEOG 458(3), GEOG 459(3), GEOG 480(3), GEOG 481(3), FOR 455(3), SOILS 415(3), or SOILS 450(3) (Sem: 5-8)

PHYSICAL/ENVIRONMENTAL GEOGRAPHY OPTION: 21 credits

PRESCRIBED COURSES (3 credits)
GEOG 455(3) (Sem: 5-8)

ADDITIONAL COURSES (18 credits)
Select 6 credits from: GEOG 105(3), GEOG 110 GN(3), or GEOG 115 GN(3) (Sem: 3-6)
GEOG 406(3), GEOG 407(3), or GEOG 408W(3) (Sem: 3-8)
Select 3 credits from: GEOG 321(3), GEOG 330(3), GEOG 352(3), GEOG 356(3), GEOG 357(3), GEOG 425(3), GEOG 459(3), GEOG 480(3), GEOG 481(3) (Sem: 5-8)
Select 6 credits from two of the following three categories:
GEOG 432W(3), GEOG 433W(3), GEOG 435(3), or GEOG 437(3)
GEOSC 303(3), GEOSC 340(3), GEOSC 452(3), GEOSC 462(3), or GEOSC 489(4)
SOILS 101 GN(3) (Sem: 5-8)

URBAN AND REGIONAL DEVELOPMENT OPTION: 21 credits

ADDITIONAL COURSES (21 credits)
GEOG 100 GS(3) or GEOG 120 GS(3) (Sem: 3-6)
Select 6 credits from: GEOG 415W GI(3), GEOG 418(3), GEOG 419(3), GEOG 420(3), or GEOG 470(3) (Sem: 3-8)
Select 3 credits from: GEOG 321(3), GEOG 330(3), GEOG 352(3), GEOG 356(3), GEOG 357(3), GEOG 421(3), GEOG 425(3), GEOG 455(3), GEOG 459(3), GEOG 480(3), or GEOG 481(3) (Sem: 5-8)
Select 9 credits from department list (Sem: 5-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
[71] The following substitutions are allowed for students attending campuses where the indicated course is not offered: CAS 100 GWS or ENGL 202C GWS can be substituted for EM SC 100S GWS.

GEOGRAPHY

College of the Liberal Arts

Geography is simultaneously a social-behavioral and an environmental science. Geographers describe, analyze, and explain the arrangement of the human and physical features on the Earth's surface. The Liberal Arts major stresses the social and behavioral aspects of geography; the Earth and Mineral Sciences major stresses the discipline's environmental perspectives. Both majors provide training in descriptive and analytical skills such as map reading, cartography, and statistics. Substantive course work in the Liberal Arts major focuses on the ways people have arranged themselves and their economic, social, and political activities on the surface of the Earth.

Bachelor's degree program graduates may find employment in federal, state, and local administrative and planning agencies or in private firms that specialize in marketing and environmental research. The Liberal Arts Geography major is especially appropriate for students seeking a deeper understanding of the human experience and for students intending to pursue postgraduate work in geography or related disciplines.

An internship program enables students to obtain work experience in the public or private sector while they are earning academic credit toward their degrees.

For the B.A. degree in Geography, a minimum of 124 credits is required.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 22 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirement in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 33 credits[1]

PRESCRIBED COURSES (15 credits)
GEOG 010 GN(3), GEOG 020 GS(3), GEOG 030 GS(3) (Sem: 1-4)
GEOG 121 GS(3), GEOG 454(3) (Sem: 5-6)

ADDITIONAL COURSES (18 credits)
GEOG 100 GS(3) or GEOG 120 GS(3) (Sem: 3-6)
Select 3 credits from GEOG 105(3), GEOG 110 GN(3), GEOG 115 GN(3) (Sem: 3-6)
Select 3 credits from GEOG 103 GS;DF(3), GEOG 124 GS(3), or GEOG 128 GS;DF(3) (Sem: 3-6)
Select 3 credits from GEOG 102 GH(3), GEOG 200(3), GEOG 401W(3), GEOG 404W(3), GEOG 427(3), GEOG 440W(3), GEOG 442(3), GEOG 443(3), or GEOG 444(3) (Sem: 5-8)
Select 6 credits from 400-level GEOG courses (Sem: 5-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

GEOSCIENCES, B.A.

College of Earth and Mineral Sciences

The geosciences are concerned with understanding earth processes and the evolutionary history of the Earth. Geoscientists work to discover and develop natural resources such as groundwater, metals, and energy sources; to solve technology-generated environmental problems such as acid mine drainage and waste disposal; to predict geological events, such as the occurrence of earthquakes and volcanism; and to solve fundamental questions concerning the origin and evolution of Earth and life. The Bachelor of Arts degree program stresses data collection; investigation, analysis and synthesis of information related to complex natural problems; rigor of thought and clarity of oral and written expression. The B.A. provides a basic education in geosciences, and is designed for students who wish to prepare themselves for careers that interface among science, social science, and business. Examples of these careers include environmental law, national and international planning or resource management, and K-12 teaching.

For the B.A. degree in Geosciences, a minimum of 120 credits is required.

GENERAL EDUCATION: 45 credits
(21 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 72 credits
(This includes 21 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 6 credits of GWS courses.)

PRESCRIBED COURSES (10 credits)
EM SC 100S GWS(3)[71] (Sem: 1-2)
GEOSC 001(3)[1] [if GEOSC 001 is not available, GEOSC 020 GN(3) may be substituted] (Sem: 1-6)
GEOSC 201(4)[1] (Sem: 3-6)

ADDITIONAL COURSES (48-51 credits)
ENGL 015 GWS(3) or ENGL 030 GWS(3) (Sem: 1-2)
MATH 140 GQ(4) or MATH 110 GQ(4) (Sem: 1-2)
GEOSC 310(4)[1] or GEOSC 320(3)[1] (Sem: 3-6)
GEOSC 202(4), GEOSC 203(4), or GEOSC 204(4) (Sem: 5-8)
Select 20 credits—two of the following sequences for 8 credits each and the third sequence for 4 credits:
—BIOL 110 GN(4), BIOL 220W GN(4) (Sem: 1-4)
—CHEM 012 GN(3), CHEM 013 GN(3), CHEM 014 GN(1), CHEM 015 GN(1) (Sem: 1-4)
—PHYS 250 GN(4), PHYS 251 GN(4) (Sem: 1-4)
Note: PHYS 211 GN(4), PHYS 212 GN(4), PHYS 213 GN(2), PHYS 214 GN(2) may substitute for up to 8 credits in Physics for students with MATH 140 GQ(4), MATH 141 GQ(4).
Select 2-4 credits of advanced mathematics in consultation with an adviser; list includes MATH 111 GQ(2), MATH 141 GQ(4), STAT 200 GQ(4), STAT 250 GQ(3) (Sem: 2-6)
Select 6 credits from 300- and 400-level GEOSC courses (Sem: 5-8)
Select 3 credits of appropriate field/laboratory experience in consultation with adviser (Sem: 6-8)
Select 3 credits of writing-intensive courses from within Earth and Mineral Sciences to include, but not limited to: GEOG 432W(3), GEOG 433W(3), GEOSC 402W(3), GEOSC 470W(3), METEO 471W(3) (Sem: 6-8)

SUPPORTING COURSES AND RELATED AREAS (11-14 credits)
Select 11-14 credits in consultation with adviser.
(Students may apply 6 credits of ROTC) (Sem: 3-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
[71] The following substitutions are allowed for students attending campuses where the indicated course is not offered: CAS 100 GWS or ENGL 202C GWS can be substituted for EM SC 100S GWS.

GEOSCIENCES, B.S.

College of Earth and Mineral Sciences

The geosciences are concerned with understanding earth processes and the evolutionary history of the Earth. Geoscientists work to discover and develop natural resources such as groundwater, metals, and energy sources; to solve technology-generated environmental problems such as acid mine drainage and waste disposal; to predict geological events, such as the occurrence of earthquakes and volcanism; and to solve fundamental questions concerning the origin and evolution of Earth and life. Our degree programs stress data collection; investigation, analysis and synthesis of information related to complex natural problems; and rigor of thought and clarity of oral and written expression. The B.S. provides a broad foundation in the physical and natural sciences for students who seek immediate employment or post-graduate education in several areas of the geosciences. Examples of careers include the petroleum and mining industries; local or federal resource management; water resources, treatment and management; energy and environmental industries; and academia. A senior thesis involving independent research is required of all students.

For the B.S. degree in Geosciences, a minimum of 121 credits is required.

GENERAL OPTION: This option is designed to provide sufficient flexibility so that the student has the opportunity to prepare for graduate school by focusing on specialized areas in the geosciences. The option's flexibility also permits students to develop a broad background in the geosciences in preparation for post-graduate majors that require breadth, such as environmental law.

HYDROGEOLOGY OPTION: This option helps prepare the student for entry-level positions in environmental agencies and firms where a specialized knowledge of groundwater and related areas is required. The option is also appropriate for students wishing to pursue an advanced degree in the area of hydrogeology.

GENERAL EDUCATION: 45 credits
(21 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 97 credits
(This includes 21 credits of General Education courses: 9 credits of GN courses, 6 credits of GQ courses, 6 credits of GWS courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 69 credits

PRESCRIBED COURSES (66 credits)
BIOL 110 GN(4), EM SC 100S GWS(3)[71], MATH 140 GQ(4), MATH 141 GQ(4) (Sem: 1-2)
CHEM 012 GN(3), CHEM 013 GN(3), CHEM 014 GN(1), CHEM 015 GN(1), PHYS 211 GN(4), PHYS 213 GN(2) (Sem: 1-4)
GEOSC 001(3) [if GEOSC 001 is not available, GEOSC 020 GN(3) may be substituted] (Sem: 1-6)
GEOSC 201(4)[1], GEOSC 202(4)[1], GEOSC 204(4) (Sem: 3-6)
GEOSC 203(4)[1], GEOSC 310(4)[1], GEOSC 465(4)[1], GEOSC 472(6) (Sem: 5-6)
GEOSC 494W(3), GEOSC 496(1) (Sem: 7-8)

ADDITIONAL COURSES (3 credits)
ENGL 015 GWS(3) or ENGL 030 GWS(3) (Sem: 1-2)

REQUIREMENTS FOR THE OPTION: 28 credits

GENERAL OPTION: 28 credits

ADDITIONAL COURSES (14 credits)
Select 14 credits from 300- and 400-level GEOSC courses: GEOSC 303(3), GEOSC 340(3), GEOSC 402(3), GEOSC 416(3), GEOSC 421(3), GEOSC 422(3), GEOSC 423(4), GEOSC 424(3), GEOSC 426(3), GEOSC 434(3), GEOSC 439(3), GEOSC 440(3), GEOSC 451(3), GEOSC 452(3), GEOSC 454(3), GEOSC 461(3), GEOSC 470W(3), GEOSC 471(3), GEOSC 489(4) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (14 credits)
Select at least 2 credits in physics from approved departmental list (Sem: 1-4)
Select 3 credits of computer science, mathematics [above the level of MATH 141 GQ(4)], or statistics (Sem: 3-6)
Select 9 credits, in consultaiton with adviser, supportive of the student's interest (Students may apply 6 credits of ROTC.) (Sem: 3-8)

HYDROGEOLOGY OPTION: 28 credits

PRESCRIBED COURSE (3 credits)
GEOSC 452(3) (Sem: 5-8)

ADDITIONAL COURSES (15 credits)
Select 3 credits from CMPSC 201C GQ(3), CMPSC 201F GQ(3), CMPSC 203 GQ(4), or STAT 250 GQ(3) [if STAT 250 is not available, STAT 200 GQ(4) may be substituted] (Sem: 3-8)
Select 3 credits from SOILS 101 GN(3), SOILS 415(3), or A S M 327(3) (Sem: 5-8)
Select 9 credits from A and B. Students must select at least 3 credits from A and 3 credits from B.
A. CHEM 034(3), CHEM 451(3), GEOSC 412(3), GEOSC 419(3), or GEOSC 457(3) (Sem: 3-8)
B. GEOSC 340(3), GEOSC 439(3), GEOSC 454(3), GEOSC 484(3), or GEOG 352(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (10 credits)
Select at least 2 credits in physics from approved departmental list (Sem: 1-4)
Select 8 credits, in consultation with advisor, supportive of the student's interest. (Students may apply 6 credits of ROTC) (Sem: 3-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
[71] The following substitutions are allowed for students attending campuses where the indicated course is not offered: CAS 100 GWS or ENGL 202C GWS can be substituted for EM SC 100S GWS.

GERMAN. B.A.

College of the Liberal Arts
For the B.A. degree in German, a minimum of 124 credits is required.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 15-18 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 37-40 credits[1]

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 16 credits

PRESCRIBED COURSES (16 credits)
GER 201(4) (Sem: 1-4)
GER 301(3), GER 302W(3), GER 310(3) (Sem: 3-6)
GER 401(3) (Sem: 5-8)

REQUIREMENTS FOR THE OPTION: 21-24 credits

GERMAN STUDIES OPTION: 24 credits
The German Studies option is designed to acquaint the student with the development of the cultures and civilization in the German-speaking countries. The option's interdisciplinary approach provides a general background and specific language skills that can serve as a basis for careers in business, civil service, journalism, law, and graduate work in many areas.

PRESCRIBED COURSES (6 credits)
GER 200 GH;GI(3) (Sem: 1-4)
GER 440(3) (Sem: 5-8)

ADDITIONAL COURSES (18 credits)
GER 431(3) or GER 432(3) (Sem: 5-8)
Select an additional 6 credits in German literature or culture at the 300 or 400 level (Sem: 5-8)
Select 9 credits related to German Studies at the 400 level, in consultation with the adviser, from history, philosophy, political science, or art history (Sem: 5-8)

GERMAN LITERATURE OPTION: 21 credits
The German Literature option will serve students interested in the literatures of the German-speaking countries and is recommended for fields such as art, comparative literature, history, philosophy, and the performing arts.

PRESCRIBED COURSES (6 credits)
GER 431(3), GER 432(3) (Sem: 5-8)

ADDITIONAL COURSES (15 credits)
Select an additional 15 credits in German at the 300 or 400 level, including a minimum of 9 credits in German literature (Sem: 5-8)

TEACHING OPTION: 21 credits
The Teaching option is designed to prepare students for the teaching of German in secondary schools. The number of elective credits enables students to study an additional foreign language, thus enhancing their teaching opportunities. Students planning to teach in public schools should schedule the appropriate courses leading to certification in consultation with an adviser in the College of Education. For the Pennsylvania teaching certificate, 41 additional credits, which includes 15 credits of student teaching, are required.

PRESCRIBED COURSES (15 credits)
GER 200 GH;GI(3) (Sem: 1-4)
GER 411(3), GER 430(3), GER 431(3), GER 432(3) (Sem: 5-8)

ADDITIONAL COURSES (6 credits)
Select 6 additional credits in German at the 300 or 400 level (Sem: 5-8)

GERMAN. B.S.

College of the Liberal Arts
The B.S. degree in German is designed to allow students to combine fluency in the German language and culture with other academic disciplines. The German-Business option develops basic German business-communication skills as well as fundamental knowledge of German economics. The German-Engineering option has a required overseas study and internship component.

Courses in German literature and culture are essential to all German B.S. options, and students in the German-Business option are encouraged to participate in the University's study abroad programs in Germany.

For the B.S. degree in German, a minimum of 123 credits is required.

GENERAL EDUCATION: 45 credits
(0-13 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 23-26 credits

REQUIREMENTS FOR THE MAJOR: 55-66 credits[1]
(This includes 0-13 credits of General Education courses: 0-6 credits of GS courses; 0-3 credits of GWS courses; 0-4 credits of GQ courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 28 credits

PRESCRIBED COURSES (25 credits)
GER 200 GH;GI(3), GER 201(4) (Sem: 1-4)
GER 301(3), GER 302W(3), GER 310(3) (Sem: 3-6)
GER 308W(3), GER 401(3), GER 408(3) (Sem: 5-8)

ADDITIONAL COURSES (3 credits)
GER 431(3) or GER 432(3) (Sem: 5-8)

REQUIREMENTS FOR THE OPTION: 27 or 38 credits

GERMAN BUSINESS OPTION: 38 credits
This option is designed to introduce German majors to the principles of business administration. The curriculum combines an exposure to managerial processes with foreign language competency in German.

PRESCRIBED COURSES (31 credits)
ACCTG 211(4), ECON 002 GS(3), ECON 004 GS(3), I B 303(3), MGMT 100(3) (Sem: 3-4)
ECON 333 GS(3), ENGL 202D GWS(3), FIN 100(3), I B 403(3), MKTG 221(3) (Sem: 5-8)

ADDITIONAL COURSES (7 credits)
MS&IS 200(4) or STAT 200 GQ(4) (Sem: 1-8)
Select an additional 3 credits of German courses at the 400 level (Sem: 5-8)

GERMAN ENGINEERING OPTION: 27 credits
(Open only to students enrolled in an engineering major.)
This option is designed to combine the study of German and Engineering in order to internationalize and enhance the study and practice of the engineering profession.

PRESCRIBED COURSES (6 credits)
GER 399 DF(3), GER 499 DF(3) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (21 credits)
Select 21 credits of engineering courses, including ENGR 295 and ENGR 395, in consultation with the engineering adviser (Sem: 3-10)

Note: All German-Engineering majors are required to participate in a one-semester engineering internship in Germany, arranged by the College of Engineering, during which 6 credits of German and up to 12 credits in engineering may be earned.

GLOBAL STUDIES

Berks-Lehigh Valley College
This major is designed for students who are interested in a liberal arts degree with a concentration in global studies. Featuring both active and collaborative classroom experiences in addition to intensive study abroad/internship experiences, the program is designed for students who wish to develop a set of analytical and interpersonal skills that will prepare them for entry-level employment in a wide range of government and non-profit organizations and agencies and in businesses and industry. Because of the flexible and broad nature of the degree, students might also use this major as preparation for graduate or professional school in business, law, or the social sciences. This program differs most notably from traditional majors in international/global studies by requiring core courses in world literature and intercultural communication, while retaining the traditional foreign language, history, and political science emphasis of most other programs. Study abroad and an internship with an international organization are also important features of this degree.

For the B.A. degree in Global Studies, a minimum of 123 credits is required.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in GENERAL EDUCATION)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 15 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 39 credits[1]
Including 24 credits at the 400 level (9-15 credits of which are included in the prescribed courses, the other 9-15 must be chosen from the option tracks below). A minimum of 3 credits of study abroad (meeting any requirement) and 3 credits of INTST 495 are required for the completion of this degree.

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 18-24 credits

PRESCRIBED COURSES (18-24 credits)
PL SC 014 GS(3) (Sem: 1-4)
C HIS 320W(3) (Sem: 1-6)
CAS 271 GI(3) (Sem: 3-4)
ENGL 403(3) (Sem: 3-6)
CAS 471 GI(3), INTST 495 (3-9) (Sem: 7-8)

LATIN AMERICAN CULTURE OPTION: 15-21 credits

ADDITIONAL COURSES (15-21 credits)
Select 15-21 credits from the following list of courses:
HIST 179 GH(3); SPAN 131 GH;GI(3) or SPAN 131W GH;GI(3) (Sem: 1-4)
SPAN 100(3)[83] (Sem: 3-6)
HIST 467(3), HIST 468(3), SPAN 200(3)[83], SPAN 220(3)[83], SPAN 253(3)[83] (Sem: 3-8)
SPAN 300W(3)[83], SPAN 420(3)[83], SPAN 476(3)[83] (Sem: 5-8)
SPAN 497(1-9)[83] (Sem: 7-8)

CONTEMPORARY HISTORY AND POLITICS OPTION: 15-21 credits

ADDITIONAL COURSES (15-21 credits)
Select 15-21 credits from the following list of courses:
HIST 120 GS(3), HIST 175 GH;GI(3), HIST 179 GH(3), HIST 181 GH;DF(3), HIST 192 GH;DF(3) (Sem: 1-6)
PL SC 413(3), PL SC 454 GI(3) (Sem: 3-8)
C HIS 440 DF(3), HIST 467(3), HIST 468(3), HSTRY 481(3), PL SC 412(3), PL SC 451(3), POLSC 428(3) (Sem: 5-8)
[1] A student enrolled in this major must maintain a grade-point average of C or better, as specified in Senate Policy 82-44.
[83] These courses also constitute the projected Spanish minor.

GRAPHIC DESIGN

College of Arts and Architecture

This major is intended to prepare students for careers in graphic design. The program includes the technical skills and the creative and intellectual disciplines essential to the practices of graphic design.

The Graphic Design option helps prepare students for employment in design studios, in advertising agencies, for publications, for film and television graphics, and as corporate designers.

For the B.S. degree in Graphic Design, a minimum of 120 credits is required.

GENERAL EDUCATION: 45 credits
(15 of these 45 credits are included in REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 0-12 credits

REQUIREMENTS FOR THE MAJOR: 81-95 credits
(This includes 15 credits of General Education courses: 6 credits of GA courses; 6 credits of GS courses; 3 credits of GWS courses.)

PRESCRIBED COURSES (57-59 credits)
ART 110S(3)[1], ART 111(3)[1], ART 120(3)[1] (Sem: 1-2)
ART 122W(3)[1], ART H 111 GA(3), ART H 112 GA(3) (Sem: 1-4)
ART 270(3)[1], ART 271(3)[1], ART 290(3)[1], B A 250(3), COMM 100 GS(3) (Sem: 3-6)
ART 370(4), ART 371(4) (Sem: 5-6)
ART 474(4) (Sem: 5-8)
ART 470(4), ART 471(4), ART 495(4-6) (Sem: 7-8)

ADDITIONAL COURSES (24 credits)
Select 3 credits from ECON 002 GS(3), ECON 004 GS(3), ECON 014 GS(3) (Sem: 1-2)
Select 6 credits from ART H 202 GA(3), ART H 305 GA(3), ART H 307 GA(3), ART H 325 GA(3), ART H 405(3-6), ART H 415(3), ART H 435(3-6), ART H 450(3), ART H 470(3) (Sem: 3-8)

Select 3 credits from ENGL 202B GWS(3), ENGL 202D GWS(3) (Sem: 3-8)
Select 8 credits from ART 300(1-4), ART 372(3), ART 376(3), ART 473(3), ART 475(1-3) (Sem: 5-8)
Select 4 credits from ART 390(4), ART 392(4) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (0-12 credits)
Proficiency in a foreign language must be demonstrated by either examination or course work equivalent to the completion of 12 credits (Sem: 1-4)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

HEALTH POLICY AND ADMINISTRATION

College of Health and Human Development

This major helps helps prepare students for management and policy positions or graduate study in the field of health care. Students in the major develop the skills and knowledge needed to understand the complex societal problem of providing access to quality health care at reasonable cost. All Health Policy and Administration students complete an internship in a health-care-related setting, giving them valuable experience and contacts in the industry. HPA students study a multidisciplinary curriculum that prepares them to work in many health care organizations including: (1) health care providers (hospitals, physician practices, nursing facilities, home health agencies, etc.); (2) health insurers (nonprofit and commercial insurers, health maintenance organizations, etc.); (3) health care consultants; (4) health care supply companies (pharmaceutical companies, medical device manufacturers, etc.); (5) health services research and policy organizations (health policy research groups, industry trade groups, etc.); and (6) local, state, and federal health agencies (local health departments, state Department of Health, federal Department of Health and Human Services, etc.). HPA students have also used the degree to prepare for graduate study in business, law, medicine or allied health fields, health administration, health services research or policy, and public health.

The requirements for the major are outlined below. Students may select courses in the Supporting Courses and Related Areas category to fulfill requirements for a minor, to develop a specialization, or to complete courses required for admission to medical, dental, law, or other graduate schools.

For the B.S. degree in Health Policy and Administration, a minimum of 120 credits is required.

GENERAL EDUCATION: 45 credits
(12 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 0-2 credits

REQUIREMENTS FOR THE MAJOR: (85-87 credits)
(This includes 12 credits of General Education courses: 6 credits of GQ courses; 6 credits of GS courses.)

PRESCRIBED COURSES (31 credits)[1]
ACCTG 211(4), ECON 002 GS(3), PL SC 001 GS(3), SOC 023 GS(3) (Sem: 1-4)
H P A 101(3), H P A 301W(3), H P A 310(3), H P A 332(3), H P A 390(3), H P A 395(3) (Sem: 3-6)

ADDITIONAL COURSES (18-20 credits)[1]
STAT 200 GQ(4) or STAT 250 GQ(3) (Sem: 1-4)
FIN 100(3) or INS 301(3) (Sem: 1-6)
CMPSC 101 GQ(3) or CMPSC 203 GQ(4) (Sem: 3-4)
Select 9 credits from H P A 401(3), H P A 410(3), H P A 420(3), H P A 431(3), H P A 433(3), H P A 440(3), H P A 442(3), H P A 445(3), H P A 447(3), H P A 450(3), H P A 455(3), H P A 460(3), H P A 470(3), or H P A 497 (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (36 credits)
(Must include at least 9 credits at the 400 level)
Select 30 credits from University-wide offerings on department list in consultation with adviser (Sem: 5-8)
Select 6 credits in economics and/or political science on department list in consultation with adviser (Sem: 5-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

HISTORY

Abington College; College of the Liberal Arts

This major provides a broad introduction to the history of the great civilizations of the world and specific areas of historical inquiry. Centered in one of the basic, traditional disciplines, the History major offers invaluable

preparation for students interested in a career in government, international relations, law, or librarianship, as well as essential training for those interested in a professional career as an academic or public historian, archivist, or secondary school teacher. Along with the perspective on the present that a study of the past engenders, the program develops skills in research, analysis, and synthesis that have proved useful in commerce and industry. The History major permits easy combination with minors, area studies, or even a concurrent major, providing flexibility in one's career choice.

For the B.A. degree in History, a minimum of 123 credits is required.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 18 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 36 credits[1]

PRESCRIBED COURSES (15 credits)
HIST 001 GH(3), HIST 002 GH(3) (Sem: 1-4)
HIST 020 GH(3), HIST 021 GH(3) (Sem: 1-4)
HIST 302W(3) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (21 credits)
(At least 12 credits must be at the 400 level.)
Select 6 credits in non-Western history from department list (Sem: 1-8)
Select 15 credits in any area (no history course excluded) (Sem: 1-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

HISTORY

Penn State Erie, The Behrend College

The B.A. degree program in History focuses on the study of the evolution of American and European institutions. This program enables students to pursue history in the traditional mode as a study of written records.

For the B.A. degree in History, a minimum of 124 credits is required. Each student must earn at least a grade of C in each 300- and 400-level course in the major field.

GENERAL EDUCATION: 45 credits
(3 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in ELECTIVES or GENERAL EDUCATION course selection)

ELECTIVES: 19 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 39 credits
(This includes 3 credits of General Education GWS courses.)

PRESCRIBED COURSES (12 credits)
HIST 001 GH(3), HIST 002 GH(3), HIST 020 GH(3), HIST 021 GH(3) (Sem: 1-8)

ADDITIONAL COURSES (18 credits)
ENGL 202A GWS(3) or ENGL 202B GWS(3) (Sem: 3-6)
Select 3 credits from PL SC or POLSC at the 400 level (Sem: 5-8)
Select 12 credits of HIST or HSTRY at the 400 level (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 9 credits from school-approved list (Sem: 1-8)

HORTICULTURE

College of Agricultural Sciences

Horticulture is an applied biological science designed for students who are seeking careers in the management of public and commercial horticultural enterprises. Because of the rapidly changing needs of professionals in this field, Horticulture combines the application of science and technology to achieve its educational goals. Horticulture provides students maximum flexibility in selecting a program of study suited to their needs and professional goals. Students can emphasize floriculture (greenhouse production or floral retail), olericulture (vegetable crops), ornamental horticulture (herbaceous and woody perennials), and pomology (fruit culture). Programs of study in the disciplines of plant breeding, plant nutrition, and horticultural physiology are also available .

Graduates are employed as commercial growers of fruit, vegetable, nursery, or greenhouse crops; as managers of retail enterprises or public and private gardens; in production and quality control, or as field supervisors in the food processing industries; in federal and state inspection services; in crop consulting; in secondary level teaching; or in sales and service work for seed, plant materials, agricultural chemicals, and other related businesses. By selection of the Science option, students can prepare for graduate study leading to careers in research, teaching, and/or extension in horticulture and related plant sciences.

BUSINESS/PRODUCTION OPTION: This option is focused on preparing students to enter the horticultural industry by providing a broad background in courses related to horticultural business and production and physiology of horticultural crops. In addition courses in pest management and business are required.

SCIENCE OPTION: This option provides students with a stronger basic science background in addition to the broad background in horticultural courses. This option is designed to prepare students for graduate study.

For the B.S. degree in Horticulture, a minimum of 123 credits is required.

GENERAL EDUCATION: 45 credits
(15-18 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 8-18 credits

REQUIREMENTS FOR THE MAJOR: 78-85 credits
(This includes 15-18 credits of General Education courses: 9 credits of GN courses; 3-6 credits of GQ courses; 3 credits of GS courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 58-59 credits

PRESCRIBED COURSES (42 credits)
CHEM 012 GN(3), CHEM 013 GN(3), CHEM 014 GN(1) (Sem: 1-4)
BIOL 110 GN(4) (Sem: 1-4)
ENT 313(2), SOILS 101 GN(3) (Sem: 5-6)
PPATH 405(3) (Sem: 7-8)
HORT 101 GN(3)[1], HORT 202(3)[1], HORT 232(3)[1], HORT 315(3)[1], HORT 390(1)[1], HORT 402W(3)[1], HORT 407(3)[1], HORT 412W(3)[1], HORT 490(1)[1] (Sem: 1-8)

ADDITIONAL COURSES (16-17 credits)
Select 3 credits from MATH 022 GQ(3), MATH 026 GQ(3), MATH 030 GQ(3), MATH 040 GQ(5), MATH 041 GQ(3), MATH 110 GQ(4), MATH 111 GQ(2), MATH 140 GQ(4), MATH 141 GQ(4) (Sem: 1-2)
Select 3 credits from STAT 200 GQ(4) or STAT 240(3) (Sem: 3-4)
Select 3 credits from AG BM 101 GS(3), ECON 002 GS(3), ECON 004 GS(3), or ECON 014 GS(3) (Sem: 3-4)
Select 6-7 credits from HORT 408(4), HORT 431(3), HORT 432(3), HORT 433(3), HORT 450(3), HORT 453(3) (Sem: 7-8)
Select 1 credit from HORT 495(1) or HORT 496(1) (Sem: 7-8)

REQUIREMENTS FOR THE OPTION: 20-26 credits

BUSINESS/PRODUCTION OPTION: 25-26 credits

PRESCRIBED COURSES (13 credits)

HORT 420(3), HORT 445(3), HORT 455(3) (Sem: 5-8)
ENT 314(1), ENT 457(3) (Sem: 7-8)

ADDITIONAL COURSES (12-15 credits)
AGRO 438A(5) or HORT 238(3) (Sem: 5-8)
Select 9-10 credits from AG 301W(3), AG BM 200(3), AG BM 407(3), B LAW 243(3), FIN 100(3), MKTG 220(3), MKTG 221(3), SPAN(4) (Sem: 5-8)

SCIENCE OPTION: 20-21 credits

PRESCRIBED COURSES (14 credits)
CHEM 034(3), BIOL 230W GN(4), BIOL 240W GN(4), BIOL 441(3) (Sem: 5-8)

ADDITIONAL COURSES (6-7 credits)
Select 6-7 credits from B M B 211(3) or B M B 251(3); PHYS 250 GN(4), PHYS 251 GN(4), or BIOL 222(3) (Sem: 5-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

HOTEL, RESTAURANT, AND INSTITUTIONAL MANAGEMENT

College of Health and Human Development

This major helps provide preparation for management positions in hotels, restaurants, institutions, and other hospitality organizations. The program is designed to give the student a broad general education and a strong management and problem-solving orientation balanced with the requisite technical skills, all of them essential for career progression to upper-management positions in the hospitality professions. The program also helps prepare students for graduate study.

The B.S. degree program consists of two options: (1) Hotel, Restaurant, and Institutional Management and (2) Management Dietetics. A minimum of 120 credits is required for the B.S. degree with the HRIM option; a minimum of 128 credits is required for the B.S. degree with the Management Dietetics option.

HOTEL, RESTAURANT, AND INSTITUTIONAL MANAGEMENT OPTION: This option helps prepare students for management positions in any segment of the hospitality industry, including hotels, restaurants, institutional or non-commercial operations, clubs, resorts, and casinos. The management focus helps provide students with the analytical, interpersonal, and organizational skills necessary to effectively function as hospitality professionals.

MANAGEMENT DIETETICS OPTION: This option helps prepare graduates for general management positions within the food services operated by or for medical organizations, health and life care facilities, college feeding, governmental agencies, and community feeding programs. The management dietitian is qualified to solve both nutrition and food service problems. Graduates may also choose to work in the management of commercial food service operations. Together with the necessary clinical experience, the option satisfies the eligibility requirements for membership in the American Dietetic Association.

GENERAL EDUCATION: 45 credits
(10-22 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 0-10 credits

REQUIREMENTS FOR THE MAJOR: 75.5 - 108 credits
(For the HRIM option, this includes 10.5 credits of General Education courses: 6 credits of GQ courses; 3 credits of GS courses; 1.5 credit of GHA courses. For the Management Dietetics option, this includes 22 credits of General Education courses: 6 credits of GQ courses; 7 credits of GN courses; 6 credits of GS courses; 3 credits of GHA courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 59-62 credits

PRESCRIBED COURSES (56 credits)
CMPSC 203 GQ(4), MKTG 221(3), STAT 200 GQ(4) (Sem: 1-4)
HRIM 201(3), HRIM 202(1), HRIM 319(3), HRIM 329(2), HRIM 330(2), HRIM 335(3), HRIM 336(3), HRIM 350(3), HRIM 365(3), HRIM 380(3), HRIM 390W(3), HRIM 430(3)[1], HRIM 435(3)[1], HRIM 442(3)[1], HRIM 466(3)[1], HRIM 490(3)[1], HRIM 492(1)[1] (Sem: 5-8)

ADDITIONAL COURSES (3-6 credits)
ECON 002 GS(3) or ECON 014 GS(3); select 0-3 credits from MATH 021 GQ(3) or equivalent (Sem: 1-4)

REQUIREMENTS FOR THE OPTION: 16.5 - 46 credits

HOTEL, RESTAURANT, AND INSTITUTIONAL MANAGEMENT OPTION: 16.5 credits

PRESCRIBED COURSES (10.5 credits)
HRIM 405(3)[1], HRIM 480(3)[1], NUTR 100 GHA(1.5), NUTR 119(3) (Sem: 5-6)

ADDITIONAL COURSES (6 credits)
Select 6 credits from any HRIM (nonrequired) course; R P M 101(2), R P M 120(3), R P M 300W(3), R P M 356(3), R P M 415(3), R P M 435(3); up to 4 credits of any foreign language (Sem: 5-8)

MANAGEMENT DIETETICS OPTION: 46 credits

PRESCRIBED COURSES (43 credits)
B M B 211(3), BIOL 141 GN(3), CHEM 012 GN(3), CHEM 034(3), MICRB 106 GN(3), MICRB 107 GN(1) (Sem: 3-4)
NUTR 120(3)[1], NUTR 251 GHA(3)[1], NUTR 358(2)[1], NUTR 360(3)[1], NUTR 370(1)[1], NUTR 400(1)[1], NUTR 445(3)[1], NUTR 446(3)[1], NUTR 452(3)[1], NUTR 453(3)[1], NUTR 456(2)[1] (Sem: 5-8)

ADDITIONAL COURSE (3 credits)
PSY 002 GS(3) or SOC 001 GS(3) (Sem: 1-4)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

HUMAN DEVELOPMENT AND FAMILY STUDIES

Altoona College; Commonwealth College; College of Health and Human Development

This major is a multidisciplinary program that examines the development of individuals and families across the life span. It enables students to prepare for professional, managerial, or scientific roles in health and human services professions, in public and nonprofit agencies, and in business and industry, as well as for advanced professional or graduate study. Students obtain a broad background in individual and family development across the life span. Courses emphasize biological, psychological, social/cultural, and economic aspects of development. Through course work and undergraduate internships or research projects, students develop skills relevant to career objectives, such as counseling, human assessment, program planning and evaluation, and research.

Four options are available within the major: (1) Children, Youth, and Family Services, (2) Adult Development and Aging Services, and (3) Life Span Human Development and Family Relations are available at University Park and (4) Community Human Services is available at the Altoona College and the Commonwealth College. The introductory paragraph to each of the options includes a brief list of career opportunities. More extensive descriptions of career opportunities in both public and private sectors are available for the program.

For the B.S. degree in Human Development and Family Studies, a minimum of 120 credits is required.

CHILDREN, YOUTH, AND FAMILY SERVICES OPTION: This option focuses on the biological, psychological, and social development of infants, children, and adolescents, with special emphasis on the structure and functioning of the family. Courses emphasize the understanding of basic theoretical and methodological issues and the development of applied skills in intervention and evaluation and in the formulation of policy. An approved field experience in a children, youth, or family services setting is required for this option. Typical employment settings include preschools, daycare centers, hospitals, institutional and community programs for emotionally disturbed, and abused or neglected children and adolescents, as well as a variety of public welfare and family service agencies. This option may also be used by students as preparation for graduate work in applied human development and human service areas.

ADULT DEVELOPMENT AND AGING SERVICES OPTION: This option focuses on the biological, psychological, and social development of adults and elderly individuals, with special emphasis on the various contexts of adult development, including work and the family. Course experiences emphasize the understanding of basic theoretical and methodological issues, and the development of applied skills in intervention and evaluation and in the formulation of policy. An approved field experience in any of a wide variety of settings that serve adults, the aged, and their families, is required for this option. Typical employment settings include mental health facilities, nursing homes and other institutions for the aged, area agencies on aging, public welfare and family service agencies, women's resource centers, human relations programs, and employee assistance programs. This option may also be used by students as preparation for graduate work in applied human development and human service areas.

LIFE SPAN HUMAN DEVELOPMENT AND FAMILY RELATIONS OPTION: This option is designed to permit maximum flexibility for students wishing to prepare themselves for careers in research and teaching, or for professional careers that require graduate training. Students in this option will be encouraged, but not required, to be in the University Scholars Program. Courses within the option emphasize a thorough

understanding of the theory and methods of life span human development and family relations, including multidisciplinary perspectives on the biological basis and sociocultural context of human development. An approved, multisemester research practicum is an integral component of this option. Typical postgraduate pursuits of students completing this option include graduate study in human development, family studies, psychology, or sociology, or advanced professional training in psychology, medicine, law, biobehavioral health, or social work.

COMMUNITY HUMAN SERVICES OPTION (offered only at the Altoona College and the Commonwealth College): This option is designed for individuals who have earned at least 60 college credit hours and are seeking preparation as human services professionals with proficiences in human development and the delivery of human services in communities. The option combines the theoretical underpinnings of human development across the life span with applied study in a community setting. Students develop written and oral communication skills throughout the program, acquire contemporary computer skills, and participate in active learning, team-building, and group exercises. The option allows students throughout the Commonwealth to become famililar with unique human services needs and organizations in Pennsylvania communities, a design that sets the option apart from other human services degrees offered throughout the Commonwealth. The option helps prepare students for positions with community human services agencies serving children, adolescents, families, and the aged.

GENERAL EDUCATION: 45 credits
(3-10 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 2-9 credits

REQUIREMENTS FOR THE MAJOR: 76-88 credits
(This includes 3-10 credits of General Education GQ courses: 3-4 credits of GQ courses; 0-3 credits of GN courses; 0-3 credits of GS courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 27-28 credits

PRESCRIBED COURSES (12 credits)[1]
HD FS 129 GS(3), HD FS 312W(3)[35] (Sem: 1-4)
HD FS 311(3), HD FS 315 DF(3) (Sem: 3-6)

ADDITIONAL COURSES (9-10 credits)[1]
Select 6 credits from HD FS 229 GS(3), HD FS 239 GS(3), HD FS 249 GS(3) (Sem: 1-4)
STAT 200 GQ(4) or EDPSY 101 GQ(3) (Sem: 1-4)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits from courses on college list that are not in student's major (Sem: 1-6)

REQUIREMENTS FOR THE OPTION: 49-60 credits

CHILDREN, YOUTH, AND FAMILY SERVICES OPTION: 50-51 credits

PRESCRIBED COURSES (12 credits)[1]
HD FS 301(3), HD FS 411(3), HD FS 414(3), HD FS 418(3) (Sem: 5-8)

ADDITIONAL COURSES (26-27 credits)[1]
Select 9 credits from HD FS 405(3), HD FS 410(3), HD FS 412(3), HD FS 415(3), HD FS 425(3), HD FS 428(3), HD FS 429(3), HD FS 430(6), HD FS 431(3), HD FS 432(3), HD FS 433(3), HD FS 450(3), HD FS 453(3), HD FS 454(3), HD FS 477(3) (Sem: 5-8)
Select 3 credits from HD FS 428(3), HD FS 429(3), or HD FS 433(3) (Sem: 5-8)
Select 14-15 credits (practice) from a. or b.:
a. Approved field practice in children, youth, or family service setting: HD FS 490(2), HD FS 495A(8), HD FS 495B(4) (Sem: 5-8)
b. Approved research experience with children, youth, or family service setting: HD FS 310M(3), 400-level related courses(6), HD FS 494H(6) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 12 credits (minimum of 6 credits at the 400 level) in consultation with adviser from University-wide offerings that develop competency in the option (a grade of C or better is required in any HD FS course taken to satisfy this requirement) (Sem: 5-8)
ADULT DEVELOPMENT AND AGING SERVICES OPTION: 50-51 credits

PRESCRIBED COURSES (15 credits)[1]
HD FS 301(3), HD FS 411(3), HD FS 414(3), HD FS 418(3), HD FS 445(3) (Sem: 5-8)

ADDITIONAL COURSES (23-24 credits)
Select 9 credits from BIOL 055 GN(3), BIOL 409(3), HD FS 413(3)[1], HD FS 425(3)[1], HD FS 434(3)[1], HD FS 446(3)[1], HD FS 447(3)[1], HD FS 477(3)[1] (Sem: 5-8)
Select 14-15 credits (practice) from a. or b.:
a. Approved field practice in adult service setting: HD FS 490(2)[1], HD FS 495A(8)[1], HD FS 495B(4)[1] (Sem: 5-8)
b. Approved research experience with adults: HD FS 310M(3)[1], 400-level related courses(6)[1], HD FS 494H(6)[1] (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 12 credits (minimum of 6 credits at the 400 level) in consultation with adviser from University-wide offerings that develop competency in option (a grade of C or better is required in any HD FS course taken to satisfy this requirement) (Sem: 5-8)

LIFE SPAN HUMAN DEVELOPMENT AND FAMILY RELATIONS OPTION: 50 credits

PRESCRIBED COURSE (12 credits)[1]
HD FS 468(3), HD FS 496(9) (Sem: 5-8)

ADDITIONAL COURSES (30 credits)
Select 6 credits[1] from HD FS 300H, HD FS 310M(3), or HD FS 496(6) (Sem: 5-8)
Select 12 credits[1] from HD FS 410(3) or HD FS 417(3); HD FS 418(3) or HD FS 424(3); HD FS 428(3), HD FS 429(3), or HD FS 433(3); HD FS 434(3) or HD FS 445(3), or if Honors, HD FS 494H(6) (Sem: 5-8)
Select 6 credits from EDPSY 400(3), EDPSY 406(3), PSY 450(3), SOC 471(3), SOC 473(3), STAT 480(1) (Sem: 5-8)
Select 6 credits from BIOL 033 GN(3), BIOL 055 GN(3), BIOL 141 GN(3), BIOL 341 GN(3), BIOL 409(3), PSY 203(3), PSY 407(3), PSY 484(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (8 credits)
Select 8 credits in consultation with adviser from University-wide offerings that develop competency in the option (a grade of C or better is required in any HD FS course taken to satisfy this requirement) (Sem: 5-8)

COMMUNITY HUMAN SERVICES OPTION: 49-57 credits

PRESCRIBED COURSES (18 credits)[1]
HD FS 301(3) (Sem: 1-4)
HD FS 302A(3) (Sem: 3-6)
HD FS 411(3) (Sem: 3-8)
HD FS 414(3), HD FS 418(3), HD FS 455(3) (Sem: 5-8)

ADDITIONAI COURSES (25-27 credits)
Select 3 credits from SOC 005 GS(3), SOC 015 GS(3), SOC 055 GS(3) (Sem: 1-4)
Select 3 credits from BI SC 004 GN(3), BIOL 055 GN(3), BIOL 141 GN(3) (Sem: 1-4)
Select 6 credits from HD FS 429(3)[1], HD FS 433(3)[1], HD FS 445(3)[1] (Sem: 5-8)
Select 13-15 credits (practice) from a or b:
a. Approved field practice in human services setting: HD FS 490(2), HD FS 495A(8), HD FS 495B(4) (Sem: 5-8)
b. Approved group project or field practice in human services setting: HD FS 401(3), HD FS 402(4), HD FS 495C(6-8) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (6-12 credits)
Select 6-12 credits (minimum of 6 credits at the 400 level), in consultation with adviser, from University-wide offerings that develop competency in the option. (A grade of C or better is required in any HD FS course taken to satisfy this requirement.) (Sem: 5-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
[35] Honors students take HD FS 300H(3) and HD FS 310M(3) (an honors writing-intensive course) but they do not take HD FS 312W(3).

INDUSTRIAL ENGINEERING

College of Engineering

The undergraduate program in industrial engineering, being the first established in the world, has a long tradition of providing a strong, technical, hands-on education in design, control, and operation of manufacturing processes and systems. The curriculum provides a broad-based education in manufacturing, operations research and ergonomics through a base of mathematics, physical and engineering sciences, and laboratory and industrial experiences. It builds a strong foundation for the development of a professionally competent and versatile industrial engineer, able to function in a traditional manufacturing environment as well as in a much broader economy, including careers in financial services, communication, information technology, transportation, health care, consulting, or academia.

The graduates of the program are expected to: (1) utilize fundamental engineering skills based in mathematics, science, and the scientific method and contemporary tools and techniques in identifying and solving manufacturing and service industry problems; (2) understand, analyze and design industrial and service processes, systems, and work environments; (3) collect, analyze and interpret data, through modeling and quantitative analysis, to make sound managerial decisions; (4) present effectively, through oral and written communications, their work and ideas; (5) perform in a professional and ethical manner as part of a diverse team in a global society. The graduates of the program are also encouraged to gain practical experience through interaction with industry prior to graduation.

The following outcomes are included in the courses taught in the program:

1. Management Systems: apply time value of money to make financial decisions; use probability concepts to solve engineering problems; estimate parameters; conduct tests of hypotheses and create regression models; apply statistical quality control methods such as process capability, control charts and tolerance allocation; design experiments; optimize and solve mathematical models of real problems using linear programming, dynamic programming,l networking, Markov chains, queuing and inventory models; and create simulation models of manufacturing and service systems and analyze simulation output.

2. Manufacturing Engineering: understand manufacturing processes for metal parts, and determine machine tool requirements; create solidification models and use them for casting design; select appropriate manufacturing processes based on part design; generate feasible process plans and develop part plans utilizing accepted tolerance specifications; program flexible manufacturing equipment and system controllers; and design logical manufacturing layouts.

3. Human Factors: measure work by applying work measurement including time studies, MTM analysis and work sampling studies; understand and apply cognitive systems engineering; identify visual, auditory, cognitive, perceptual and environmental aspects of human performance; perform task analysis; and evaluate human-computer interfaces.

Students are allowed considerable flexibility in selecting their own programs. Interested students may further specialize in one or two of the above areas by appropriate use of 12 credits of engineering and science electives.

For the B.S. degree in Industrial Engineering, a minimum of 132 credits is required. This baccalaureate program in Industrial Engineering is accredited by the Engineering Accreditation Commission of ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202-4012; telephone 410-347-7700; or **www.abet.org**.

GENERAL EDUCATION: 45 credits
(21 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 108 credits
(This includes 21 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses; 3 credits of GWS courses.)

PRESCRIBED COURSES (86 credits)
CHEM 012 GN(3)[1], CHEM 014 GN(1), ED&G 100(3), MATH 140 GQ(4)[1], MATH 141 GQ(4)[1], PHYS 211 GN(4)[1] (Sem: 1-2)
CSE 271(3), E MCH 012(3), E MCH 210(5)[1], MATH 220 GQ(2), MATH 231(2), MATH 250(3), PHYS 212 GN(4) (Sem: 3-4)
ENGL 202C GWS(3), I E 302(3)[1], I E 310(3)[1], I E 311(3)[1], I E 322(3)[1], I E 323(3)[1], I E 327(3)[1], I E 328(3)[1], I E 425(3)[1], MATSE 259(3) (Sem: 5-6)
I E 405(3), I E 408W(3), I E 423(3), I E 450(3), I E 453(3) (Sem: 7-8)

ADDITIONAL COURSES (10 credits)
Select 1 credit of First-Year Seminar (Sem: 1-2)
CMPSC 201C GQ(3) or CMPSC 201F GQ(3) (Sem: 1-2)
ECON 002 GS(3) or ECON 004 GS(3) (Sem: 1-2)
M E 023(3) or M E 030 (3) (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 3 credits as a science selection from department list (Sem: 3-4)
Select 3 credits as a technical selection from department list [28] (Sem: 7-8)
Select 6 credits in I E from senior selections from department list (Sem: 7-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
[28] Students may apply 6 credits of ROTC towards the technical and senior electives or 3 credits of ENGR 295(1), ENGR 395(1), and ENGR 495(1) toward the technical elective.

INDUSTRIAL HEALTH AND SAFETY

College of Earth and Mineral Sciences

This program is designed to provide students with the technical and managerial skills necessary to address the occupational health and safety concerns associated with the extraction and utilization activities of the minerals and fuels industries, the construction industry, and other heavy industries. Employers in the United States are mandated by federal and state laws to provide workplaces that are free of recognized hazards to personnel. Agencies such as OSHA and MSHA have placed increased emphasis on employer responsibilities for the health and safety of their employees. Annually, work-related incidents cost the United States in excess of $40 billion, affecting not only workman's compensation but also reducing productivity. This program includes a general background in the basic sciences, followed by a core program emphasizing the nature of the various industries, as well as the economic, technical, and policy issues of occupational health and safety.

For the B.S. degree in Industrial Health and Safety, a minimum of 129 credits is required.

GENERAL EDUCATION: 45 credits
(24 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 108 credits
(This includes 24 credits of General Education courses: 6 credits of GWS courses; 6 credits of GQ courses; 9 credits of GN courses; and 3 credits of GS courses.)

PRESCRIBED COURSES (86 credits)
BIOL 141 GN(3)[1], BIOL 142(1), CHEM 012 GN(3)[1], CHEM 014 GN(1)[1], CHEM 034(3), CMPSC 203 GQ(4), EM SC 100S GWS(3)[71], MATH 140 GQ(4), MATH 141 GQ(4), PSY 002 GS(3) (Sem: 1-2)
E MCH 012(3), E MCH 210(5), MGMT 100(3), PHYS 211 GN(4), PHYS 212 GN(4) (Sem: 3-4)
I E 327(3), I H S 400(3)[1], I H S 410(3), I H S 420(3), I H S 447(4), I H S 430(3)[1], I H S 440(3), I H S 445(3) (Sem: 5-6)
I H S 450(3), I H S 470(3), I H S 490(1), I H S 495W(6) (Sem: 7-8)

ADDITIONAL COURSES (7 credits)
ENGL 015 GWS(3) or ENGL 030 GWS(3) (Sem: 1-2)
MS&IS 200(4) or STAT 200 GQ(4) (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (15 credits)
Select 3 credits from the I H S course list of industrial or manufacturing processes (Sem: 5-6)
Select 12 credits from the I H S-approved list, in consultation with adviser, supportive of the student's interests. (Students may apply 6 credits of ROTC.) (Sem: 7-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
[71] The following substitutions are allowed for students attending campuses where the indicated course is not offered: CAS 100 GWS or ENGL 202C GWS can be substituted for EM SC 100S GWS.

INFORMATION SCIENCES AND TECHNOLOGY

Abington College; Berks-Lehigh Valley College; Capital College; Commonwealth College; School of Information Sciences and Technology

This major is structured to provide students with the theoretical frameworks and skill sets necessary to compete and be productive in the information technology-intensive global context that defines the new "Information Age." Specifically, the degree will be focused on a program that will build an understanding of core information technologies and related areas of study; will prepare students for the practical application of various information sciences and related technologies; and engage students in sharpening their abilities to think critically and to work in teams. All this will be done with considerable interdisciplinary integration in order to expose students to the cognitive, social, institutional, and global environments of IST. Team projects in most courses, a required

internship, and a senior capstone experience provide additional, focused venues for involving students in the cutting-edge issues and technologies of the field.

INFORMATION SYSTEMS: DESIGN & DEVELOPMENT OPTION: This option is focused on expanding the skills needed to develop advanced information technology systems using state-of-the-art tools and techniques. The emphasis is on providing the student with both knowledge in the design, implementation, testing and evolution of complex software systems as well as a set of project-oriented, team-programming experiences.

INFORMATION TECHNOLOGY: INTEGRATION & APPLICATION OPTION: This option is designed to prepare students to use information technology to realize a variety of system-based goals (e.g., reliability, accessibility, efficiency, etc.). It is focused on developing a theoretical foundation and the skill set needed for integrating information technology into different systems for the purpose of enhancing system performance. The emphasis is on providing the student with both the theoretical frameworks needed to use information technology as a system attribute as well as a set of application-oriented experiences and skills.

INFORMATION CONTEXT: PEOPLE, ORGANIZATIONS, AND SOCIETY OPTION: This option focuses on how information technology affects social change and the delivery of information to the consumer. This includes the human-machine interface; organization and retrieval of information; digital libraries; information and telecommunications services; information and media industry structures; software services and intermediaries; telecommunications and information law and policy; sociological aspects of technology change; multimedia; and art, design, and aesthetics.

For the B.S. degree in Information Sciences and Technology, a minimum of 125 credits is required.

GENERAL EDUCATION: 45 credits
(12 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of the Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 7 credits

REQUIREMENTS FOR THE MAJOR: 85 credits
(This includes 12 credits of General Education courses: 6 credits of GQ courses; 3 credits of GS courses; and 3 credits of GWS courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 64 credits

PRESCRIBED COURSES (36 credits)
CMPSC 101 GQ(3)[1], IST 110(4)[1], IST 210(3)[1], IST 220(3)[1], IST 230(3), IST 240(3) (Sem: 1-4)
STAT 200 GQ(4) (Sem: 3-6)
IST 495(1) (Sem: 3-8)
IST 301(3), IST 331(3)[1], IST 402(3-9) (Sem: 5-8)
IST 440W(3) (Sem: 7-8)

ADDITIONAL COURSES (10 credits)
ECON 002 GS(3), ECON 004 GS(3), or ECON 014 GS(3) (Sem: 1-4)
ENGL 202C GWS(3) or ENGL 202D GWS(3) (Sem: 1-4)
MATH 110 GQ(4) or MATH 140 GQ(4) (Sem: 1-4)

SUPPORTING COURSES AND RELATED AREAS (18 credits)
Attainment of third-level proficiency in a single foreign language (12 credits). Proficiency must be demonstrated by either examination or course work. See the admission section of the general information in this Bulletin for the placement policy for Penn State foreign language courses. (Sem: 1-4)
Select 6 credits of international courses in foreign culture from School-approved list (Sem: 5-8)

REQUIREMENTS FOR THE OPTION: 21 credits

INFORMATION SYSTEMS: DESIGN & DEVELOPMENT OPTION: 21 credits

PRESCRIBED COURSES (3 credits)
IST 311(3) (Sem: 5-8)

ADDITIONAL COURSES (6 credits)
Select 6 credits from IST 411(3), IST 412(3), or IST 413(3) (Sem: 5-8)
SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 12 credits from School-approved list (Sem: 5-8)

INFORMATION TECHNOLOGY: INTEGRATION & APPLICATION OPTION: 21 credits

PRESCRIBED COURSES (9 credits)
IST 302(3), IST 420(3), IST 421(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 12 credits from School-approved list (Sem: 5-8)

INFORMATION CONTEXT: PEOPLE, ORGANIZATIONS, AND SOCIETY OPTION: 21 credits

PRESCRIBED COURSES (6 credits)
IST 431(3) and IST 432(3) (Sem: 5-8)

ADDITIONAL COURSES (3 credits)
IST 302(3) or IST 413(3) (Sem: 1-4)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 12 credits from School-approved list (Sem: 5-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

INFORMATION SYSTEMS

Capital College

This major prepares students to enter rapidly expanding fields associated with technology including programming, systems analysis and design, database administration, network management, support services and training, and management of information resources. Students obtain competence both in information technology and in business theory. Thus, the curriculum combines technical content with managerial aspects of information systems. Each student's background is complemented with basic business instruction in accounting, marketing, management, and finance. With business and non-business electives, the program is designed to develop necessary skills to be an effective Information Systems employee. Because the Harrisburg area is the center of industry and economic development for south central Pennsylvania, students are provided with many opportunities to experience the exciting and challenging world of business.

For a B.S. in Information Systems, a minimum of 122 credits is required. At least 50 percent of the business credit hours required for the degree must be taken at the Capital College. No more than 61 credits should be from business and business-related courses.

ENTRY TO MAJOR REQUIREMENTS: Entry to the Information Systems major requires the completion of 9 entry-to-major courses: ENGL 015 GWS(3) or ENGL 030 GWS(3), MATH 110 GQ(4) or MATH 140 GQ(4), ACCTG 211(4), CMPSC 203 GQ(4) or M I S 103(3), M I S 204(2), STAT 200 GQ(4) or MS&IS 200(4), ECON 002 GS(3), ECON 004 GS(3), B A 243(4) and a 2.00 or higher cumulative grade-point average. Additional information about this major is available in the office of the Director of Undergraduate Studies, School of Business Administration at Penn State Harrisburg.

GENERAL EDUCATION: 45 credits
(10-12 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education Course Requirements in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: Select 5-8 credits of non-business courses.

REQUIREMENTS FOR THE MAJOR: 81-82 credits
(This includes 10-12 credits of General Education courses: 3 credits of GWS courses; 3 credits of GS courses; 4-6 credits of GQ courses)

PRESCRIBED COURSES (49 credits)
ACCTG 211(4), M I S 204(2), B A 243(4) (Sem: 1-4)
ECON 002 GS(3), ECON 004 GS(3) (Sem: 1-4)
ENGL 202D GWS(3) (Sem: 3-4)
FINAN 320(3), BUS 361(3), BUS 364W GI(3), BUS 462(3), INFSY 390(3)[1] (Sem: 5-8)
INFSY 307(3)[1], INFSY 445(3) [1], INFSY 450(3)[1] (Sem: 5-8)
MNGMT 310(3), MRKT 370(3) (Sem: 5-8)

ADDITIONAL COURSES (20-21 credits)
Select 3-4 credits from M I S 103(3) or CMPSC 203 GQ(4) (Sem: 1-4)

Select 4 credits from MATH 110 GQ(4) or MATH 140 GQ(4) (Sem: 1-4)
Select 4 credits from MS&IS 200(4) or STAT 200 GQ(4) (Sem: 1-4)
Select 9 credits [1] from the following: INFSY 413(3), INFSY 430(3), INFSY 435(3), INFSY 436, INFSY 440(3), INFSY 446(3), INFSY 447(3), INFSY 448(3), INFSY 489(3) (Sem: 5-8)
Three (3) of these credits must be selected from INFSY 413(3), 436(3), or 440(3)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 12 credits from 200-400 level business courses from: ACCT, BUS, ECNMS, FINAN, INFSY, MNGMT, or MRKT in consultation with an academic adviser and in support of the student's interests. (Sem: 3-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

INTEGRATIVE ARTS

Abington College; Altoona College; College of Arts and Architecture
Integrative Arts is an interdisciplinary major available to students who desire a curriculum that crosses over traditional single discipline lines. The Integrative Arts student initially establishes an academic plan with the assistance of an approved adviser. The plan must contain a core component of 36 credits and an elective component of 19 credits. The two components combined must clearly illustrate that the plan has clarity, purpose, and cohesion.

For the B.A. degree in Integrative Arts, a minimum of 124 credits is required.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 19 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 36 credits

SUPPORTING COURSES AND RELATED AREAS: 36 credits[1]
(Must include at least 15 credits at the 400 or equivalent level)
Select 24 credits from an arts area (Sem: 1-8)
Select 12 credits from other arts areas (Sem: 1-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

INTERDISCIPLINARY HUMANITIES

Capital College
This major helps students appreciate, understand, and interpret relationships among the arts, ideas, media, and values that have shaped Western and world cultures. Students are expected to be active learners who can synthesize, interpret, and communicate knowledge and experience through writing, speaking, and creative expression in a variety of media. The school helps students meet these goals by offering a range of interdisciplinary and discipline-based courses in the arts, art history, communication studies, English, history, literature, music, philosophy, theatre, and writing.

For a B.Hum. degree in Interdisciplinary Humanities, a minimum of 120 credits is required.

ENTRY TO MAJOR REQUIREMENTS: Entry to the Interdisciplinary Humanities major requires the completion of 28 or more credits and a 2.00 or higher cumulative grade-point average.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 11-15 credits

REQUIREMENTS FOR THE MAJOR: 60-64 credits
(At least 36 of the last 60 credits must be earned at Penn State, according to University Policy 83-80.)
PRESCRIBED COURSES (6 credits)
I HUM 300W(3)[1], I HUM 400(3)[1] (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (54-58 credits)
(At least 12 credits of supporting courses must be at the 400 level.)
Select 12-16 credits: 1 course each from 4 different major/program offerings in AMSTD, C ART, ART H, A&A, CAMS, CMSTD, COMM, HCOMM, CMLIT, ENGL, ENLSH, C HIS, HIST, HUM, LIT, C MUS, MUSIC, PHIL, PHLOS, RL ST, SPCOM, THTRE, or choice(s) from a School of Humanities approved list. (Sem: 3-8)
Select 15 credits from AM ST, AMSTD, C ART, CMSTD, COMM, HCOMM, CMLIT, ENGL, ENLSH, C HIS, HIST, HUM, LIT, C MUS, MUSIC, PHIL, PHLOS, RL ST, SPCOM, THTRE, or choice(s) from a School of Humanities approved list. (Sem: 3-8)
Select 9 credits[1] from Interdisciplinary Humanities (HUM or I HUM) courses (Sem: 4-8)
Select 18 credits from the School of Humanities approved list in consultation with an academic adviser or select a Capital College minor in support of the student's interests. (Sem: 5-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

INTERDISCIPLINARY LIBERAL ARTS

Berks-Lehigh Valley College

This major provide students an interdisciplinary understanding of literature, culture, and society. The major includes upper-level courses in literature and related liberal arts and an emphasis on the interrelations among literature and other cultural and social practices. In its core courses as well as in the upper-level courses, the major will emphasize critical thinking, critical reading, writing, an understanding of the role of information technology in the liberal arts, and the understanding of differing points of view. A unique interdisciplinary major, the program in Interdisciplinary Liberal Arts will provide students with a foundation for work in the twenty-first century in a variety of fields, as well as preparation for the study of law or for graduate study in English, American Studies, or Culture Studies.

For the B.A. degree in Interdisciplinary Liberal Arts, a minimum of 127 credits is required.

GENERAL EDUCATION: 45 credits
(3 of these 45 credits are included in the Requirements for the Major.)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 19 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin)

REQUIREMENTS FOR THE MAJOR: 42 credits[1]
(This includes 3 credits of General Education GH courses.)

PRESCRIBED COURSES (12 credits)
PHIL 010 GH(3) (Sem: 3-4)
ENGL 200(3) (Sem: 3-6)
L A 283(3), SOC 109(3) (Sem: 3-8)

ADDITIONAL COURSES (15 credits)
Select 3 credits from ENGL 135 GH;GI(3), ENGL 139 GH;GI(3), ENGL 182(3), or ENGL 194 GH;GI(3) (Sem: 3-4)
Select 3 credits from ENGL 221W(3), ENGL 222W(3), ENGL 231W(3), or ENGL 232W(3) (Sem: 3-4)
Select 3 credits from ENGL 402(3) or ENGL 403(3) (Sem: 5-8)
Select 6 credits from CMLIT 405(3), CMLIT 406(3), ENGL 400(3), ENGL 401(3), ENGL 483(3), or ENGL 495(1-12) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (15 credits)
Select 12 credits from 400-level courses in American studies, art, art history, foreign language, history, philosophy, psychology, political science, sociology, speech communications, or theatre arts from division list (Sem: 5-8)
Select 3 credits in an internship or senior project from division-approved list (Sem: 7-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

INTERNATIONAL BUSINESS

Penn State Erie, The Behrend College

The International Business major is designed to prepare students for the increasingly international nature of business. Compared to other business majors, this one provides greater emphasis on knowledge and skills that are needed to conduct business in an international setting. This includes issues concerned with accomplishing organizational objectives through the coordination of human, material, information, and financial resources across national boundaries. In addition to studying the core business courses, students in this major will receive a broad exposure to the complexity of international business through required course work in international business, international culture, a foreign language, and a study abroad experience. In addition to preparing students for an international business environment, the major aims to provide them with knowledge of a specific business discipline by requiring the completion of all the requirements for a second business major. As a result, students meet the University requirements for a concurrent major. Graduates of the INT B major should be better prepared to function effectively as employees of small businesses with developing international operations or as members of larger business organizations with extensive global operations.

For the B.S. degree in International Business (in conjunction with a second business major), a minimum of 128 credits is required. Each student must earn at least a grade of C in each 300- and 400-level course in the major field.

GENERAL EDUCATION: 45 credits
(15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION and REQUIREMENTS FOR THE MAJOR course selections)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR course selections)

ELECTIVES: 1 credit

REQUIREMENTS FOR THE MAJOR: 97 credits
(This includes 15 credits of General Education courses: 6 credits of GQ courses, 6 credits of GS courses, 3 credits of GWS courses.)

PRESCRIBED COURSES (42 credits)
CMPSC 203 GQ(4) (Sem: 1-2)
ACCTG 211(4), B A 243(4), ECON 002 GS(3), ECON 004 GS(3), ENGL 202D GWS(3), M I S 204(2), MS&IS 200(4) (Sem: 3-4)
FNC 300(3), MANGT 300(3), MANGT 310(3), MRKTG 300(3) (Sem: 5-6)
MANGT 470W(3) (Sem: 7-8)

ADDITIONAL COURSES (16 credits)
MATH 110 GQ(4) or MATH 140 GQ(4) (Sem: 1-2)
Select 12 credits from ECNS 470(3), FNC 470(3), MANGT 480 GI(3), MRKTG 470 GI(3), or other 300- or 400-level international business course in consultation with adviser (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (39 credits)
Select 15 credits in a foreign language and culture (Sem: 1-6)
Select a minimum of 21 credits from one business supporting course group in consultation with adviser. Students must complete the requirements for a second School of Business major (Sem: 5-8)
Select 3 credits from school-approved, non-business Education Abroad courses (Sem: 5-8)

Note: Students must attain third-level proficiency in a single foreign language (0-12 credits) and select 3-15 credits from the school-approved list of non-business international courses. See general information section of the Bulletin for the Penn State placement policy on foreign languages. Students receiving advanced placement in foreign language may substitute courses from school-approved foreign language and culture course list to complete the credits for this requirement.

INTERNATIONAL POLITICS

College of the Liberal Arts

This major, administered within the Department of Political Science, is designed to provide students with a broad, comprehensive education in international relations and foreign policy. While the bulk of the required courses are in the areas of international and comparative politics or area studies, the curriculum also comprises courses in international economics, political geography, and diplomatic history as major requirements. The major provides an opportunity to study in detail a variety of crucial contemporary issues—nuclear strategy and

arms control, European integration, North-South issues, economic competition among the major powers, etc.—as well as analysis of foreign policymaking in the United States and other nations.

The major is intended to help prepare students for career opportunities with the U.S. government executive agencies dealing with foreign affairs (State Department, C.I.A., Defense Department, etc.); with relevant committees of the U.S. Congress; with multinational corporations, banks, and consulting firms; and with international organizations. The major also provides preparation for law and business schools and for graduate study in political science, international relations, and public policy.

For the B.A. degree in International Politics, a minimum of 123 credits is required.

GENERAL EDUCATION: 45 credits
(3 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in ELECTIVES or GENERAL EDUCATION course selection)

ELECTIVES: 18 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 39 credits[1]
(This includes 3 credits of GS General Education courses.)

PRESCRIBED COURSES (12 credits)
PL SC 001 GS(3), PL SC 014 GS(3) (Sem: 1-4)
PL SC 418(3), PL SC 442(3) (Sem: 5-8)

ADDITIONAL COURSES (15 credits)
Select 3 credits from HIST 120 GS(3) or HIST 420(3) (Sem: 1-8)
Select 3 credits from ECON 333 GS(3) or I B 303(3) (Sem: 1-8)
Select 3 credits from ECON 002 GS(3) or ECON 004 GS(3) (Sem: 1-4)
Select 3 credits from PL SC 020 GS(3), PL SC 022 DF(3), PL SC 145 DF(3), or PL SC 150 DF(3) (Sem: 1-4)
Select 3 credits from GEOG 128 GS;DF(3) or GEOG 460(3) (Sem: 3-6)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 12 credits chosen from 400-level political science courses in foreign policy, international politics, comparative politics, PL SC 419(3), and/or from foreign language courses beyond the 12th-credit level (6 of these 12 credits must be at the 400 level) (Sem: 3-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

INTERNATIONAL STUDIES

College of the Liberal Arts

This interdisciplinary major is intended to provide, for undergraduate students in another major, the opportunity for an integrated course of international study leading to a second baccalaureate major. This major is available only as a concurrent or sequential major. The program includes 12 credits of foreign language study beyond the 12th-credit level or equivalent proficiency, and education abroad or equivalent work-internship experience, related advanced course work, and a senior course or project in International Studies. The language, international experience, and advanced study should be integrated around a thematic or geographical focus.

The degree (e.g., B.A., B.S., B.F.A., B.B.A., etc.) will normally match that of the student's first major.

Students in baccalaureate degree programs other than those leading to the B.A. who desire a B.A. degree in International Studies will receive concurrent degrees and have to fulfill all requirements for concurrent degrees and for the B.A. degree as indicated under "Concurrent Majors and Sequential Majors" in the GENERAL INFORMATION section of this bulletin and under "Baccalaureate Degree Requirements" in the College of the Liberal Arts college introductory section.

REQUIREMENTS FOR THE MAJOR: 33 credits

PRESCRIBED COURSES (3 credits)
INLST 493(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (30 credits)
Students must complete 12 credits as participants in a Penn State or Penn State-approved education abroad program of a minimum of eight weeks in length or complete an internship or equivalent work experience approved by the International Studies adviser. (At least 3 credits must be at the 400 level.) (Sem: 5-8)

Select 12 credits of foreign language beyond the 12th-credit level proficiency in one foreign language. (At least 3 credits must be at the 300 level or higher. Courses taught in translation are not included.) [Note: For foreign language majors, study must be in a foreign language other than primary major.] (Sem: 1-5)

Select 6 credits of related course work from an approved list or additional foreign language study at the advanced level, or 3 credits of related course work selected from an approved list or additional foreign language study and 3 credits in a senior project, selected in consultation with the International Studies adviser (Sem: 7-8)

ITALIAN

College of the Liberal Arts

The major offers training in the skills required for fluency in Italian and a grounding in Italian culture, civilization, and literature. Its aim is to open to the student both the traditions of one of the major formative components of the Western world and the continuing vitality of modern Italian life.

As one of the humanistic programs of the College of the Liberal Arts, the Italian major is not designed to be directly professional and vocational. Nevertheless, the requirement structure of the major, which includes two courses (8 credits) in another Romance language or Latin, leaves room for the election of a concurrent-major program leading to career opportunities in government services, social services, secondary and higher education, business, and foreign commerce and tourism.

For the B.A. degree in Italian, a minimum of 125 credits is required.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 24 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 32 credits[1]

PRESCRIBED COURSES (12 credits)
IT 301(3) (Sem: 1-4)
IT 302(3), IT 350(3), IT 351W(3) (Sem: 3-6)

ADDITIONAL COURSES (12 credits)
Select 12 credits from IT 415(3), IT 422(3), IT 450(3), IT 460(3), IT 496(1-18), or IT 497(1-9) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (8 credits)
Select 8 credits from another Romance language or Latin (Sem: 5-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

JAPANESE

College of the Liberal Arts

Japan is both a culturally important nation and a major international presence in the contemporary world. The major in Japanese is designed to develop skills in speaking, understanding, reading, and writing Japanese, along with an understanding of the grammatical structure of the Japanese language and a general acquaintance with Japanese culture, literature, and civilization. The major can also help students prepare for professional careers in which a knowledge of this language is useful. Twelve credits of study in Japan, in a Penn State Education Abroad Program or another program subject to departmental approval, are included in the major.

Students planning to teach in public schools should schedule the appropriate courses leading to certification in consultation with an adviser in the College of Education.

For the B.A. degree in Japanese, a minimum of 123 credits is required.

GENERAL EDUCATION: 45 credits
(0-9 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)
FIRST-YEAR SEMINAR: (Included in ELECTIVE or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in REQUIREMENTS FOR THE MAJOR)

WRITING ACROSS THE CURRICULUM: (Included in ELECTIVES or GENERAL EDUCATION course selection)

ELECTIVES: 18-27 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 36 credits[1]
(This includes 0-9 credits of General Education GA, GH, or GS courses.)
(At least 21 credits must be at the 400 level.)
(Students must take at least 12 of their credits in Japan, either in a Penn State Education Abroad program or another program subject to departmental approval. For curricular sequencing, this Education Abroad experience must occur in the fall semester of the junior year, unless otherwise approved by the department.)

PRESCRIBED COURSES (6 credits)
JAPNS 110(3) (Sem: 3-4)
JAPNS 120(3) (Sem: 1-6)

ADDITIONAL COURSES (21 credits)
Select 21 credits in Japanese at the 400 level (Sem:3-8)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 9 credits pertaining to Japan, such as courses in art history, comparative history, geography, history, philosophy, political science, religious studies, theatre arts, or other fields, selected from departmental list (Sem: 1-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

JEWISH STUDIES

College of the Liberal Arts
This major furnishes students with expertise in Jewish Studies and in the Hebrew language. It offers undergraduates the opportunity to pursue a targeted program of area study leading to a baccalaureate major in the liberal arts. The major requires 6 credits beyond 12-credit-level proficiency in Hebrew or in another appropriate language, subject to approval. Advanced language study is especially recommended for those planning to continue their education beyond the Bachelor of Arts degree. In addition, the program requires the following: an overseas educational experience or internship experience (the latter in the United States or abroad); advanced course work; plus a capstone seminar for which a senior thesis project may be substituted.

For the B.A. degree in Jewish Studies, a minimum of 121 credits is required.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in ELECTIVES or GENERAL EDUCATION course selection)

ELECTIVES: 19 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits

REQUIREMENTS FOR THE MAJOR: 33 credits[1]
(At least 12 credits must be at the 400 level, including J ST 484.) Language study beyond the 12-credit proficiency may count toward 400-level credit with the approval of the Jewish Studies adviser.

PRESCRIBED COURSES (6 credits)
J ST 010 GH;GI(3) (Sem: 1-2)
J ST 484(3) (Sem: 5-8)
SUPPORTING COURSES AND RELATED AREAS (27 credits)
Select 6 credits in language study (beyond the 12th-credit level) (Sem: 3-8)
Select 15 credits of related course work from an approved list in consultation with adviser (Sem: 3-8)
Select 6 credits of education abroad or internship approved by faculty adviser (Sem: 5-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

JOURNALISM

College of Communications

The primary goal of this major is to educate students for careers as writers, reporters, editors, and photographers with newspapers, magazines, television, radio, and in the publications and public information departments of governments and industry. Courses in the major are about evenly divided between those emphasizing skills and professional procedures used by journalists and those seeking an understanding of journalism and mass communications as they relate to society.

Students may wish to concentrate in a specific area. To that end, the faculty recommends these possibilities, but at the same time encourages creative combinations.

Broadcast: COMM 360, COMM 465, COMM 466

Visual communications: COMM 269, COMM 468, COMM 469

Print (reporting): COMM 462, COMM 463, COMM 464W, COMM 467

Print (editing): COMM 269, COMM 467, COMM 468

Nonfiction: COMM 230, COMM 430, COMM 462

Students must select at least 80 credits in non-COMM courses, including at least 65 credits in the liberal arts and sciences.

For the B.A. degree in Journalism, a minimum of 120 credits is required.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 6 credits

COLLEGE OF COMMUNICATIONS BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 45 credits[1]

PRESCRIBED COURSES (12 credits)
COMM 260W(3) (Sem: 3-4)
COMM 403(3), COMM 409(3), COMM 460W(3) (Sem: 5-8)

ADDITIONAL COURSES (15 credits)
Select 6 credits from COMM 230(3-6), COMM 269(3), COMM 360(3), COMM 430(3-6), COMM 461(3), COMM 462(3), COMM 463(3), COMM 464W(3), COMM 465(3), COMM 466(3), COMM 467(3), COMM 468(3), COMM 469(3), or COMM 495(1-3)[17] (Sem: 5-8)
Select 9 credits from COMM 205 GI(3), COMM 401(3), COMM 405(3), COMM 408(3), COMM 410(3), COMM 411(3), COMM 413(3), COMM 419(3), COMM 496(1-18), or COMM 499(1-12) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (18 credits)
University-approved minor (18 credits)
[Students majoring in journalism must take a University-approved minor outside the College of Communications. The minimum requirement for a minor is 18 credits. By careful planning, a student may use General Education and Bachelor of Arts courses to help fulfill this requirement. In lieu of a minor, students may take a concurrent major or concurrent degree, as long as it is outside the College of Communications. Students should consult with their adviser as soon as possible about this requirement.] (Sem: 1-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.
[17] Internship in news with newspaper, radio, or TV. See the director of the internship program for specifics.

KINESIOLOGY

Berks-Lehigh Valley College (Wellness Development Specialization option only);
College of Health and Human Development

Kinesiology offers a comprehensive program of study in the science of human movement and is designed for students who want to prepare for professions involving physical activity and for graduate study in related areas. Four options are offered: (1) Athletic Training; (2) Movement Science; (3) Teacher Preparation; and (4) Wellness Development Specialization.

All options require a culminating practicum or research experience. First Aid, CPR, and Water Safety Instructor (WSI) certification are highly recommended for the Teacher Preparation option. (See additional requirements for student teaching under General Information, Special Academic Programs.) Relocation away from the University Park campus is generally necessary for student teaching and may be necessary for

practicums in other options. First Aid and CPR are also recommended for the Applied Fitness Emphasis in the Movement Science option.

Students who have completed a minimum of 28 credits and have a 2.00 cumulative grade-point average are eligible for entrance into the major after completing an Entrance to Major form and meet the following requirements: complete, with a grade of C or higher, the following two courses: KINES 141(3) and KINES 180(3).

For the B.S. degree in Kinesiology with an option in Athletic Training, a minimum of 123 credits is required; with an option in Movement Science, a minimum of 122 credits is required; with an option in Teacher Preparation, a minimum of 128 credits is required; with an option in Wellness Development Specialization, a minimum of 126 credits is required.

ATHLETIC TRAINING OPTION: This option provides a concentrated program of courses designed to prepare students for a career in the profession of athletic training. The option has been designed to meet the standards for certification by the National Athletic Trainers Association—Board of Certification and legal certification by the Commonwealth of Pennsylvania.

Students are admitted into the program on a competitive basis following completion of prerequisite courses (see requirements for admission). Students must also meet the "Technical Standards for the Undergraduate Athletic Training Program at Penn State University" related to the physical and psycho-emotional demands placed upon students in the option. The Technical Standards can be found at **www.hhdev.psu.edu/kines/undergrad/athletic_tr.html** or obtained through the The Pennsylvania State University, Department of Kinesiology, 276 Recreation Building, University Park, PA 16802. Upon admission, students complete a 5-semester sequence of course work and supervised clinical rotations. Students typically commit 200 to 300 hours to clinical practical experiences in each of the last 4 semesters of the program. The course sequencing and prerequisite courses can be found at **www.hhdev.psu.edu/kines/undergrad/athletic_tr.html** or obtained through the Department of Kinesiology. Full course descriptions are in the Bulletin (available online at **www.psu.edu/bulletins/bluebook**).

Students seeking to transfer from other colleges or universities will have their transcripts evaluated after acceptance to Penn State to identify those courses and credits that will be applied to completion of degree requirements. Course work specific to athletic training will not be considered for transfer unless completed in a Commission on Accreditation of Allied Health Education Programs accredited athletic training education program.

Minimum Requirements for Admission to the Athletic Training Option (admission is competitive—meeting minimum requirements does not assure admission into the option):

1. Submission of written application (**www.hhdev.psu.edu/kines/undergrad/athletic_tr.html** or the Department of Kinesiology Advising Office, 276 Recreation Building, University Park, PA 16802).
2. Cumulative grade-point average of 2.5.
3. 3.0 grade-point average in BIOL 129 GN(4), KINES 135(3), KINES 231(2), KINES 233(3).
4. Completion of entrance interview with Athletic Training Program Director or designee.
5. Evidence of ability to meet the physical and psycho-emotional standards as outlined in the "Technical Standards for the Undergraduate Athletic Training Program at Penn State" (**www.hhdev.psu.edu/dept/kines/undergrad/athletic_tr.html**, or the Department of Kinesiology Advising Office, 276 Recreation Building, University Park, PA 16802).

MOVEMENT SCIENCE OPTION: This option consists of three areas that provide an opportunity for the concentrated study of physical activity in relation to science and medical emphasis; human behavior and humanities emphasis; and applied fitness emphasis. Upon graduation, students enter a variety of careers in relation to physical activity, be they professional, business-oriented, or private agencies, and also may enter graduate school.

TEACHER PREPARATION OPTION: This option helps prepare teachers for K-12 Health and Physical Education. It includes all the academic requirements for the Instructional I Certificate in these fields issued by the Pennsylvania Department of Education. There are entrance requirements for all University teacher preparation programs:

1. A minimum cumulative grade-point average of 3.00.
2. An assessment of reading, writing, and mathematics.
3. ENGL 015 or ENGL 030.
4. 6 credits of quantification.
5. 3 credits of literature.
6. 48 credits minimum.
7. Completion of an Education Core: EDPSY 014(3) and EDTHP 115A GS(3).
8. An early field experience, preferably in a diverse setting (one with at least 25 percent minority students): for KINES majors, KINES 295A(1).
9. 6 credits of required course work in the teaching field: for KINES majors, KINES 141(3) and KINES 180(3).
10. Documented evidence showing completion of at least 80 hours of paid or volunteer work in a setting with an age-appropriate population, including a minimum of 40 hours of work in each of two settings, one of which

should involve students from an underrepresented group, or who are from rural or urban areas, but different from the candidate's own background.

11. Approval by the Teacher Preparation option coordinator.

WELLNESS DEVELOPMENT SPECIALIZATION OPTION: (offered only at the Berks-Lehigh Valley College) This option is a program of study in the science of human movement. This program offers Kinesiology background and applied experience in health assessment, exercise physiology, motor skill development, stress management, nutrition and healthy living skills. The program also has an emphasis in basic business skills of accounting, marketing. management, and entrepreneurship.

This program will prepare students with a knowledge base, practical experience, and entrepreneurial business skills for careers in human wellness. This combination will enable graduates in this field to compete for employment in the corporate fitness arena, private fitness clubs, community-based fitness organizations, hospital and university settings or possibly to operate their own wellness consulting company.

Graduates will be able to scientifically assess fitness levels of people. Analyzing those assessments, graduates will then be capable of designing and implementing appropriate exercise programs. The program is designed to prepare graduates for advanced study in related fields, if they so choose.

GENERAL EDUCATION: 45 credits
(7-17 of these credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 0-14 credits

REQUIREMENTS FOR THE MAJOR: 70-98 credits
(This includes 7-17 credits of General Education courses: Athletic Training option—4 credits of GQ courses; 7 credits of GN courses; 3 credits of GS courses; 3 credits of GHA courses. Movement Science option—3 credits of GN courses; 4 credits of GQ courses. Teacher Preparation option—3 credits of GN courses; 3 credits of GQ courses; 6 credits of GS courses; 3 credits of GHA courses. Wellness Development Specialization option—8 credits of GN courses; 4 credits of GQ courses; 3 credits of GHA courses.

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 28 credits

PRESCRIBED COURSES (28 credits)[1]
BIOL 141 GN(3), KINES 141(3), KINES 180(3) (Sem: 1-4)
KINES 202(4) (Sem: 3-4)
KINES 321(3), KINES 345(3), KINES 350(3), KINES 360(3), KINES 384(3) (Sem: 3-6)

REQUIREMENTS FOR THE OPTION: 42-70 credits

ATHLETIC TRAINING OPTION: 67 credits

PRESCRIBED COURSES (66 credits)
BIOL 129 GN(4)[1], KINES 135(3), PSY 002 GS(3) (Sem: 1-2)
PHYS 250 GN(4), NUTR 251 GHA(3), STAT 200 GQ(4) (Sem: 3-4)
KINES 231(2)[1], KINES 233(3) (Sem: 3)
KINES 232(3), KINES 334(3) (Sem: 4)
KINES 395F(3)[1], KINES 335(3), KINES 436(3), KINES 437(2) (Sem: 5)
KINES 395G(3)[1], KINES 336(3), KINES 434(3), KINES 435(2) (Sem: 6)
KINES 395I(3)[1], KINES 438W(3) (Sem: 7)
KINES 495F(3[1], KINES 431(3) (Sem: 8)

ADDITIONAL COURSES (1 credit)
Select 1 credit of First-Year Seminar (Sem: 1-2)

MOVEMENT SCIENCE OPTION: 42-50 credits

PRESCRIBED COURSES (12-18 credits)[39]
KINES 295B(1) (Sem: 1-4)
STAT 200 GQ(4) (Sem: 3-6)
KINES 395B(1) (Sem: 5-8)
KINES 495B(6-12) (Sem: 7-8)
ADDITIONAL COURSES (30-32 credits)

Select one course from categories a, b, and c; select 6-7 credits from category d (Sem: 5-8)
a. KINES 400(3), KINES 456(4), KINES 481W(3), KINES 484(3)
b. KINES 420(3), KINES 463(3), KINES 483(3)
c. KINES 439W(3), KINES 440(3), KINES 441(3), KINES 442(3), KINES 443(3), KINES 444(3), KINES 446 GI(3)
d. KINES 400(3), KINES 420(3), KINES 439W(3), KINES 440(3), KINES 441(3), KINES 442(3), KINES 443(3), KINES 444(3), KINES 446 GI(3), KINES 456(4), KINES 457(3), KINES 481W(3), KINES 483(3), KINES 484(3), KINES 492W(3)

Select 15 credits—choose one of the following emphasis area groups and select 15 credits from that emphasis, of which at least 6 credits must be at the 400 level:

a. Physical Activity/Science and Medical Emphasis (15 credits)
CHEM 012 GN(3), CHEM 013 GN(3), CHEM 014 GN(1), CHEM 015 GN(1) (Sem: 1-4)
B M B 211(3), B M B 221(2), BB H 101 GHS(3), BIOL 110 GN(4), BIOL 129 GN(4), BIOL 142(1), BIOL 240W GN(4), CHEM 034(3), CHEM 035(3), CHEM 038(3), CHEM 039(3), MATH 140 GQ(4), MATH 141 GQ(4), NUTR 251 GHA(3), PHYS 211 GN(4), PHYS 212 GN(4), PHYS 250 GN(4), PHYS 251 GN(4) (Sem: 3-6)
BB H 310W(3), BB H 315 GI(3), BB H 411(3), BB H 432(3), BIOL 409(3), BIOL 421(4), BIOL 472(3), BIOL 473(2), KINES 310(3), KINES 409(3), KINES 456(4), KINES 457(3), KINES 481W(3), KINES 484(3), KINES 485(3), KINES 492W(3), PHIL 432(3) (Sem: 5-8)

b. Physical Activity/Human Behavior and Humanities Emphasis (15 credits)
HIST 020 GH(3), HIST 021 GH(3), HIST 100 GH(3), HIST 107 GH(3), PHIL 100 GH(3), PHIL 103GH(3) (Sem: 1-4)
EDPSY 010(3), EDTHP 115(3) (Sem: 3-4)
PSY 202 GS(3), PSY 203(3) (Sem: 3-6)
EDTHP 440(3), KINES 310(3), KINES 420(3), KINES 439W(3), KINES 440(3), KINES 441(3), KINES 442(3), KINES 443(3), KINES 444(3), KINES 446 GI(3), PHIL 425(3), PHIL 427(3), PHIL 432(3), PSY 402(3) (Sem: 5-8)

c. Physical Activity/Applied Fitness Emphasis (15 credits)
KINES 060 GHS(3), SOC 023 GS(3) (Sem: 1-4)
KINES/ESACT activity GHA (2) (Sem: 1-6)
BB H 101 GHA(3), BIOL 055 GN(3), HD FS 129 GS(3), HD FS 249 GS(3), NUTR 251 GHA(3), NUTR 358(2), PSY 213 GS(3), PSY 231 GS(3), PSY 243 GS(3), R P M 277 GI(3) (Sem: 3-6)
BB H 315 DF(3), BB H 415(3), BB H 420(3), BB H 432(3), BIOL 409(3), CN ED 415(3), H P A 457(3), HD FS 411(3), HD FS 413(3), HD FS 434(3), HD FS 445(3), HD FS 446(3), HD FS 447(3), KINES 445(3), KINES 456(4), KINES 457(3), KINES 481W(3), KINES 492W(3), PSY 445(3), R P M 462(3), SOC 423(3), SOC 435(3) (Sem: 5-8)

TEACHER PREPARATION OPTION: 70 credits[18]

PRESCRIBED COURSES (69 credits)
EDPSY 010 GS(3), EDPSY 014(3), EDPSY 101 GQ(3), EDTHP 115A GS(3), KINES 109(1.5), KINES 101(1.5), KINES 103(1.5), KINES 126(3), KINES 165(3), KINES 215(3), KINES 295A(1), NUTR 251 GHA(3) (Sem: 1-4)
KINES 111(1.5), KINES 105(1.5), KINES 107(1.5) (Sem: 3-6)
BB H 446(3), KINES 382(4), KINES 390(4), KINES 395A(1), KINES 445(3), KINES 490W(3), SPLED 400(3) (Sem: 5-8)
KINES 495A(14) (Sem: 8-9)

ADDITIONAL COURSES (1 credit)
Select 1 credit of First-Year Seminar (Sem: 1-2)

WELLNESS DEVELOPMENT SPECIALIZATION OPTION: 68 credits

PRESCRIBED COURSES (62 credits)
BIOL 129 GN(4), CHEM 012 GN(3), CHEM 014 GN(1), STAT 200 GQ(4), PHYS 250 GN(4) (Sem: 1-2)
ACCTG 211(4), KINES 200(3), KINES 295B(1), MIS 103(3), NUTR 251 GHA(3) (Sem: 3-4)
B A 243(4), KINES 356(3), KINES 358(1)(Sem: 5-6)
KINES 420(3), KINES 456(4), KINES 457(3), KINES 461W(2), KINES 462W(2), KINES 495C(10) (Sem: 7-8)

ADDITIONAL COURSES (6 credits)
Select 6 credits from B A 321(3), B A 322(3), MKTG 301(3), MGMT 301(3) (Sem: 7-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.
[39] Students interested in research/writing should consult with adviser relative to possible substitutions.
[18] A grade of C or better per course is required for teacher certification.

LABOR AND INDUSTRIAL RELATIONS, B.A.

College of the Liberal Arts

This major permits students to undertake a study of work and the employment relationship in the context of a liberal arts education. A broad foundation of theoretical and professional knowledge is provided through a multidisciplinary approach. The B.A. and B.S. degrees draw on the perspectives of disciplines such as industrial relations, economics, history, law, sociology, and psychology. This focus includes the nature and functions of the institutions involved in the employment relationship. The B.S. degree requires more course work in quantification than the B.A. degree.

Graduates of labor and industrial relations are equipped for employment in business, government, and labor organizations as labor relations specialists, personnel and human resource specialists, researchers, organizers, consultants, and professionals in mediation and arbitration. The degree is also appropriate preparation for graduate study and law school.

For the B.A. degree in Labor and Industrial Relations, a minimum of 123 credits is required.

GENERAL EDUCATION: 45 credits
(6 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 20-21 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 39-40 credits[1]
(This includes 6 credits of GS General Education courses.)

PRESCRIBED COURSES (15 credits)
ECON 002 GS(3), ECON 315 GS(3), L I R 100 GS(3), PSY 231 GS(3), (Sem: 3-8)
L I R 458W(3) (Sem: 5-8)

ADDITIONAL COURSES (9-10 credits)
L I R 101 GS(3) or L I R 433(3) (law) (Sem: 5-8)
L I R 136 GI(3) or L I R 400(3) (diversity) (Sem: 5-8)
L I R 212(4) or L I R 414W(3) (analytical thinking) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (15 credits)
Select 9-12 credits of L I R courses, at least 3 at the 400 level (only 3 credits of L I R 495 and 3 credits of L I R 496 may be used to satisfy this requirement) (Sem: 3-8)
Select 3-6 credits in consultation with adviser from department list, at least 3 at the 400 level (Sem: 5-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

LABOR AND INDUSTRIAL RELATIONS, B.S.

College of the Liberal Arts

This major permits students to undertake a study of work and the employment relationship in the context of a liberal arts education. A broad foundation of theoretical and professional knowledge is provided through a multidisciplinary approach. The B.A. and B.S. degrees draw on the perspectives of disciplines such as industrial relations, economics, history, law, sociology, and psychology. This focus includes the nature and functions of the institutions involved in the employment relationship. The B.S. degree requires more course work in quantification than the B.A. degree.

Graduates of labor and industrial relations are equipped for employment in business, government, and labor organizations as labor relations specialists, personnel and human resource specialists, researchers, organizers, consultants, and professionals in mediation and arbitration. The degree is also appropriate preparation for graduate study and law school.

For the B.S. degree in Labor and Industrial Relations, a minimum of 123 credits is required.

GENERAL EDUCATION: 45 credits
(6-10 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 21-26 credits

REQUIREMENTS FOR THE MAJOR: 62-63 credits[1]
(This includes 6-10 credits of General Education courses: 6 credits of GS course; 0-4 credits of GQ courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 36-37 credits

PRESCRIBED COURSES (16 credits)
(Some courses in this category have prerequisites that are not included in the major.)
L I R 100 GS(3), L I R 212(4) (Sem: 3-8)
ECON 002 GS(3), ECON 315 GS(3), PSY 231 GS(3) (Sem: 1-8).

ADDITIONAL COURSES (13 credits)
(Some courses in this category have prerequisites that are not included in the major.)
L I R 101 GS(3) or L I R 401(3) [law] (Sem: 3-8)
MS&IS 200(4) or STAT 200 GQ(4) (Sem: 3-8)
L I R136 GI(3) or WMNST 136 GI(3) or L I R 400(3) (diversity) (Sem: 5-8)
L I R 458W(3) or HIST 458W(3) or L I R 414W(3) (analytical writing) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (33-34 credits)
(L I R courses that are used in the Additional Courses category may not be double-counted to satisfy this requirement. Some courses in this category have prerequisites that are not included in the major.)

Select 15-21 credits from appropriate L I R courses, at least 9 at the 400 level (only 3 credits of L I R 495 or 3 credits of L I R 496 may be used to satisfy this requirement) (Sem: 5-8)

Select 12-19 credits in consultation with adviser from the department list, at least 6 at the 400 level, 3 each from 3 categories:
a. ECON 342 GS(3), ECON 370 GS(3), ECON 412(3), ECON 436 GI(3), ECON 445(3) (Sem: 5-8)
b. MGMT 100(3), MGMT 321(3), MGMT 331(3), MGMT 341(3), MGMT 424(3) (Sem: 3-8)
c. PL SC 451(3), PL SC 471(3), PL SC 473(3), PL SC 474(3) (Sem: 5-8)
d. PSY 441(3), PSY 451(3), PSY 461(3) (Sem: 5-8)
e. SOC 119 GS;GI(4), SOC 409 GS;GI(3), SOC 444(3), SOC 455(3), SOC 456(3) (Sem: 3-8)
f. ACCTG 211(4), CAS 352(3), H P A 460(3), HD FS 425(3), HIST 155 GS(3), PHIL(S T S) 407(3) (Sem: 5-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

LANDSCAPE ARCHITECTURE

College of Arts and Architecture

Landscape architecture is is the art of design, planning, or management of the land and of the natural and man-made elements upon it. As an academic discipline, it embodies creative, cultural, philosophical, and scientific knowledge bases. As a professional discipline, the practice of landscape architecture includes site design, urban design, master planning, community planning, regional planning, resource conservation, and stewardship.

For those selected to major in this field, the program is a five-year curriculum leading to a professionally accredited Bachelor of Landscape Architecture degree. A minor is strongly encouraged. One semester of the curriculum is spent in a required semester abroad. The program helps prepare graduates for either advanced study or professional careers. The curriculum develops both the creative disciplines and the technical skills essential to practice, as well as to the pursuit of interests in related fields. With appropriate work experience with a registered practitioner, graduates are eligible to take the state licensing examination.

For the Bachelor of Landscape Architecture degree, a minimum of 151 credits is required.

GENERAL EDUCATION: 45 credits
(18 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 17-18 credits

REQUIREMENTS FOR THE MAJOR: 106-107 credits
(This includes 18 credits of General Education courses: 3 credits of GQ courses; 9 credits of GN courses; 6 credits of GA courses.)

PRESCRIBED COURSES (85 credits)
BIOL 110 GN(4), GEOG 010 GN(3), LARCH 060 GA(3)[1], LARCH 100S(1)[1], LARCH 136(3)[1] (Sem: 1-2)
ARCH 210 GA(3), LARCH 127(3)[1], LARCH 325(3)[1], LARCH 325A(1)[1], LARCH 327(3)[1], LARCH 327A(1)[1], LARCH 336(3)[1] (Sem: 3-4)
HORT 137(3), LARCH 425(3)[1], LARCH 425A(1)[1], LARCH 427(3)[1], LARCH 427A(1)[1], LARCH 435(3)[1], LARCH 437(3)[1], LARCH 444(1)[1], LARCH 457(3)[1] (Sem: 5-6)
HORT 138(3), LARCH 445(4)[1], LARCH 445A(1)[1], LARCH 460W(3)[1], LARCH 499A GI(1)[1], LARCH 499B GI(4)[1], LARCH 499C GI(3)[1], LARCH 499D GI(4)[1] (Sem: 7-8)
LARCH 451(4)[1], LARCH 451A(1)[1], LARCH 453(4)[1], LARCH 453A(1)[1] (Sem: 9-10)

ADDITIONAL COURSES (15-16 credits)
MATH 026 GQ(3) or higher (except MATH 035) (Sem: 1-2)
ART 010 GA(3) or ART 020 GA(3) (Sem: 3-4)
ART H 201 GA(3), ART H 202 GA(3), ART H 405(3-6), ART H 412(3), ART H 415(3), ART H 420(3), ART H 456(3), ART H 458(3), ART H 497(1-9) (if topic is architectural history), or ARCH 315 GA(3), ARCH 316 GA(3) (Sem: 9-10)
BIOL 220W GN(4), EARTH 103 GN(3), ENT 202 GN(3), E R M 210 GN(3), GEOG 115 GN(3), GEOSC 010 GN(3) or GEOSC 020 GN(3) (Sem: 1-10)
AM ST 100 GH(3), ENGL 180 GH(3), GEOG 102 GH(3), HIST 021W GH(3), PHIL 013 GH(3) or PHIL 109 GH(3) (Sem: 1-10)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 3 credits in art history (Sem: 1-2)
Select 3 credits in humanities (Sem: 9-10)

Integrated BLA–MLA Program

The Department of Landscape Architecture offers an integrated BLA-MLA program that is appropriate to those students who already hold a baccalaureate degree and wish to receive an accredited professional undergraduate degree and a post-professional graduate degree focused on advanced critical inquiry. Returning adult students interested in this Integrated Undergraduate-Graduate (IUG) degree program will come from a wide array of backgrounds.

The curriculum takes advantage of several efficiencies provided through the IUG program at Penn State. It requires four years of course work, with the first six semesters (3 years) in the BLA, and the seventh and eighth semester (4 years) in the MLA. In effect, the sixth semester serves as an overlap semester offering the content of MLA-level work within the course structure of the BLA. Details of the recommended course sequence are provided in the BLA-MLA Student Handbook available through the department.

It is the expectation of the BLA-MLA program that many or all of the general education requirements currently stipulated by the University will have been met during the applicant's prior undergraduate work. Each applicant's academic record will be carefully reviewed to ensure that it achieves a high degree of equivalency with current Penn State general education criteria. Once this process is successfully completed, incoming BLA-MLA students will already have achieved an undergraduate major, and they will be released from the department requirement of 18 credits of free electives required of regular BLA students. The IUG program format identifies 12 credits required for the MLA to be applied to both undergraduate and graduate degree programs. In addition to regular BLA and MLA courses, core courses specifically required of BLA-MLA students include LARCH 400, LARCH 400A, LARCH 455, and LARCH 501. Other non-LARCH courses required by the major include ARCH 210, 3 credits in ART H, BIOL 110, HORT 137, and HORT 138. A faculty BLA-MLA adviser will be assigned to all BLA-MLA students to facilitate application and course selection procedures.

To be admitted to the BLA/MLA program, applicants must meet the follow requirements:
—Must have completed a bachelor's degree from any discipline prior to entry into the BLA-MLA program.
—Must submit evidence of creativity (portfolio or other), evidence of analytical ability (research paper or other), and an essay explaining why the individual seeks to study landscape architecture at Penn State.
—Must submit an IUG program application.
—Must submit items normally required prior to entry in the BLA and MLA programs, including a full undergraduate transcript, both an undergraduate and graduate school application, GRE scores, 3 letters of recommendation, and, if applicable, TOEFL scores (minimum score of 600 is required). Applicants to the BLA-MLA program must submit the undergraduate application by December 31 and the graduate application by January 15.

LANDSCAPE CONTRACTING

College of Agricultural Sciences

Landscape contracting involves constructing, establishing, and maintaining landscapes from small residential projects to large commercial and industrial projects, as well as producing plans for small-scale residential and commercial sites. Students develop skills in construction, site design, plant material usage, plant establishment, and landscape maintenance. Students are also educated in areas such as graphics, surveying, soils, turfgrass management, weed and pest management, and in business operations.

Students are encouraged to obtain on-the-job experience in landscape contracting by working with a landscape maintenance or construction firm, or other related business. Credits for this experience are available for those who choose to enroll in an internship.

A wide variety of opportunities exist for landscape contracting graduates. They may be employed by design/build firms, landscape management firms, nurseries, or garden centers. Others may choose to work for municipalities, golf courses, parks, or botanical gardens.

For the B.S. degree in Landscape Contracting, a minimum of 130 credits is required.

DESIGN/BUILD OPTION: This option focuses on the development of skills in the planning and implementation of landscape projects. Employment opportunities exist with landscape contracting companies, irrigation companies, and retail centers.

MANAGEMENT OPTION: This option provides professional education in the management of landscapes. Employment opportunities include positions with landscape management companies and golf courses.

GENERAL EDUCATION: 45 credits
(21 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 7-14 credits

REQUIREMENTS FOR THE MAJOR: 92-99 credits
(This includes 21 credits of General Education courses: 3 credits of GWS courses; 3 credits of GA courses; 3 credits of GQ courses; 9 credits of GN courses; 3 credits of GS courses)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 74 credits

PRESCRIBED COURSES (71 credits)
CHEM 012 GN(3), GEOSC 020 GN(3), HORT 101 GN(3)[1], LARCH 060 GA(3), MATH 026 GQ(3) (Sem: 1-2)
ACCTG 211(4), BIOL 110 GN(4), B LAW 243(3), HORT 120(2)[1], HORT 137(3)[1], SOILS 101 GN(3), SPAN 001(4) (Sem: 3-4)
B A 250(3), HORT 138(3)[1], HORT 408(4)[1], MKTG 220(3), TURF 235(3) (Sem: 5-6)
A S M 217(3), ENGL 202D GWS(3), HORT 131(3)[1], HORT 410W(3)[1], HORT 468(2)[1], LARCH 127(3) (Sem: 7-8)

ADDITIONAL COURSES (3 credits)
AG EC 101 GS(3), ECON 002 GS(3), ECON 004 GS(3), or ECON 014 GS(3) (Sem: 3-4)

REQUIREMENTS FOR THE OPTION: 18-25 credits

DESIGN/BUILD OPTION: 25 credits

PRESCRIBED COURSES (23 credits)
ART 020 GA(3), E G 010(1), HORT 220(3)[1] (Sem: 3-4)
HORT 269(3)[1], HORT 464(4)[1] (Sem: 5-6)
HORT 368(4)[1], HORT 466(5)[1] (Sem: 7-8)

ADDITIONAL COURSES (2 credits)
Select at least 2 credits from ENT 313(2), ENT 314(1), HORT 409(1)[1], TURF 238(3)[1], PPATH 318(2) (Sem: 5-6)

MANAGEMENT OPTION: 18 credits

PRESCRIBED COURSES (18 credits)
ENT 313(2), ENT 314(1), HORT 297(3)[1], SOILS 401(3), TURF 236(3) (Sem: 7-8)
HORT 409(1)[1], PPATH 318(2), HORT 250(3)[1] (Sem: 7-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

LATIN AMERICAN STUDIES

College of the Liberal Arts

This interdisciplinary major is designed for students who want a basic understanding of Latin America. The program is organized so that it may be combined with a second major or a minor subject.

For the B. A. degree in Latin American Studies, a minimum of 121 credits is required.

GENERAL EDUCATION: 45 credits
(9-12 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 21-24 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 40 credits[1]
(This includes 9-12 credits of General Education courses: 6 credits of GH courses; 3-6 credits of GS courses.)

PRESCRIBED COURSES (22 credits)
PORT 001(4), SPAN 200(3) (Sem: 1-4)
ANTH 045 GS;GI(3), HIST 178 GH;GI(3), HIST 179 GH;GI(3), SPAN 131 GH;GI(3) (Sem: 3-6)
PL SC 456(3) (Sem: 5-8)

ADDITIONAL COURSES (18 credits)
Select 18 credits from the following:
AAA S/SPAN 132 GI(3), AAA S 200DF(3), ANTH 008 GS;GI(3), ANTH 422(3), ANTH 440(3), CMLIT 405(3), CMLIT 405(3), ECON 002 GS(3), ECON 004 GS(3), ECON 014 GS(3)[2] (Sem: 3-8)
ECON 333 GS(3), ECON 433(3), GEOG 440W(3), HIST 467(3), HIST 468(3), PL SC 422(3), PL SC 442(3), PL SC 457(3-6), SPAN 300W(3), SPAN 305(3), SPAN 410(3), SPAN 412(3), SPAN 472(3), SPAN 476(3) (Sem: 5-8)
PORT 002(4), PORT 003(4), PORT 405(3), PORT 456(3) (Sem: 1-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
[2] Choose only one course from ECON 002, ECON 004, or ECON 014.

LETTERS, ARTS, AND SCIENCES

Abington College; Altoona College; Commonwealth College: Penn State Delaware County, DuBois, Fayette, Hazleton, Shenango, Wilkes-Barre, York; College of the Liberal Arts; World Campus

Letters, Arts, and Sciences is a multidisciplinary, theme-oriented, and student-designed major leading to a bachelor of arts degree. The major consists of 36 credits, divided into two sections. The core (12 credits) consists of 3 credits each in the following: research methods/projects; communication skills; theory/application; and critical analysis. The option (24 credits) consists of courses directed toward the student's theme, 15 credits of which must be at the 400 level. The student chooses one of six options: Arts; Humanities; Social and Behavioral Sciences; Science and Mathematics; Science, Technology, and Society; or Liberal Studies.

In order to be eligible for entrance to the major, the student must submit a proposal. In consultation with an LAS adviser, the student formulates a proposal designing a program that investigates a theme from the viewpoint of at least three different subject areas. Students may not duplicate existing majors from any academic area. An important standard for entrance to the Letters, Arts, and Sciences major is the student's ability to design a program with academic integrity worthy of a bachelor of arts degree.

For the B.A. degree in Letters, Arts, and Sciences, a minimum of 123 credits is required.

EARLY ADMISSION PROGRAM FOR PROFESSIONAL SCHOOLS: If a student is accepted and enrolled as a degree candidate in a professional postgraduate degree program requiring three years or more to complete (such as medical school, dental school, law school, theological seminary, etc.) and if that student completes 94 undergraduate credits at Penn State including General Education, B.A. requirements, and the LAS 12-credit core requirements, that student may use up to 30 credits from the professional school to complete the B.A. in LAS, Liberal Studies option.

It must be emphasized that only top students are accepted into professional school programs on such an early admission basis and that not every professional school has such a policy. Students must have enrolled in LAS prior to attending the professional school to request graduation in LAS.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 18 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 36 credits[1]

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 12 credits

SUPPORTING COURSES AND RELATED AREAS (12 credits)
In consultation with adviser, select 3 credits in research methods/projects from courses that involve research methodology or that focus on a research project; select 3 credits in communication skills from courses that focus on expression including those in verbal, symbolic, and written skills; select 3 credits in theory/application from courses that focus on theory, principle, central concepts, or fundamental issues; select 3 credits in critical analysis from courses that focus on evaluation, synthesis, and analysis. (Sem: 1-8)

ARTS OPTION: 24 credits

SUPPORTING COURSES AND RELATED AREAS (24 credits)
In consultation with adviser, select 24 credits from University-wide offerings in the humanities with at least 15 at the 400 level representing at least three different subject areas. (Sem: 1-8)

HUMANITIES OPTION: 24 credits

SUPPORTING COURSES AND RELATED AREAS (24 credits)
In consultation with adviser, select 24 credits from University-wide offerings in the humanities with at least 15 at the 400 level representing at least three different subject areas. (Sem: 1-8)

LIBERAL STUDIES OPTION: 24 credits

SUPPORTING COURSES AND RELATED AREAS (24 credits)
In consultation with adviser, select 24 credits from University-wide offerings with at least 15 at the 400 level representing at least three different subject areas. (Sem: 1-8)

SCIENCE/MATHEMATICS OPTION: 24 credits

SUPPORTING COURSES AND RELATED AREAS (24 credits)
In consultation with adviser, select 24 credits from University-wide offerings in math and/or science with at least 15 at the 400 level representing at least three different subject areas. (Sem: 1-8)

SCIENCE, TECHNOLOGY, AND SOCIETY OPTION: 24 credits

SUPPORTING COURSES AND RELATED AREAS (24 credits)
In consultation with adviser, and approval of S T S program director, select 24 credits in S T S with at least 15 at the 400 level representing at least three different subject areas. (Sem: 1-8)

SOCIAL AND BEHAVIORAL SCIENCES OPTION: 24 credits

SUPPORTING COURSES AND RELATED AREAS (24 credits)
In consultation with adviser, select 24 credits from University-wide offerings in the social and behavioral sciences with at least 15 at the 400 level representing at least three different subject areas. (Sem: 1-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

LIBERAL ARTS AND EARTH AND MINERAL SCIENCES; LIBERAL ARTS AND ENGINEERING—CONCURRENT DEGREE PROGRAMS

College of the Liberal Arts
These programs require ten semesters of study, the first six in the College of the Liberal Arts (during which the student completes 70 credits in General Education and Bachelor of Arts requirements and 33 to 37 basic engineering or science requirements), and the last four in either the College of Earth and Mineral Sciences or the College of Engineering (during which the student completes the credits required in the selected major in Earth and Mineral Sciences or Engineering). An additional 9 credits of study in the General Arts and Sciences major consisting of 3 credits in each of three areas (arts, humanities, and social and behavioral sciences) are taken following the completion of the sixth semester.

Upon completion of the program, the B.A. in General Arts and Sciences will be awarded by the College of the Liberal Arts and the B.S. by the College of Earth and Mineral Sciences or the College of Engineering. The majors available in the College of Earth and Mineral Sciences are Environmental Systems Engineering, Geosciences, Mining Engineering, Polymer Science, Mineral Economics, Petroleum and Natural Gas Engineering, Ceramic Science and Engineering, Metals Science and Engineering, or Meteorology. The majors available in the College of Engineering are Aerospace, Agricultural, Chemical, Civil, Electrical, Environmental, Industrial and Management Systems, Mechanical, or Nuclear Engineering, or Engineering Science.[44]

To be eligible for this program, a student must file an application for entrance with the associate dean for undergraduate studies, College of the Liberal Arts, not later than the third semester. Entrance to the program requires that the student satisfy all regular requirements of the College of the Liberal Arts and the College of Earth and Mineral Sciences or the College of Engineering. In addition, special requirements may need to be satisfied when enrollment controls are imposed on programs in any of the colleges because of space limitations. Once a student has met all the requirements for entrance to this program, transfer from the College of the Liberal Arts to the College of Earth and Mineral Sciences or the College of Engineering, with enrollment in one of the majors listed, will be approved automatically at the end of the sixth semester if the student continues to make normal progress toward the concurrent degree and has maintained a cumulative average of 2.00 or higher. Students entering majors in the College of Engineering must complete the following courses with a grade of C or higher: CHEM 012 GN(3) and CHEM 014 GN(1), MATH 140 GQ(4), MATH 141 GQ(4), and PHYS 201 GN(4), and meet the required cumulative grade-point average for the requested engineering major.

Students are advised of the absolute necessity for scheduling classes in exact sequence during the first six semesters of Concurrent Degree study. It is imperative that students obtain, from the General Arts and Sciences Office, 129 Sparks Building, a copy of the Concurrent Degree requirements worksheet that enumerates the specific course requirements for the two programs for semesters one through six.

GENERAL EDUCATION: 45 credits
(15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description for General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in GENERAL EDUCATION course selection or REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in GENERAL EDUCATION course selection or REQUIREMENTS FOR THE MAJOR)

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description for Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 12 credits

EARTH AND MINERAL SCIENCES OR ENGINEERING COMPONENT: 89-91 credits
(This includes 15 credits of General Education courses: 6 credits of GQ courses and 9 credits of GN courses.)

SEMESTERS ONE THROUGH SIX (33-34 credits)[45]

PRESCRIBED COURSES (27 credits)
CHEM 014 GN(1), CHEM 015 GN(1), MATH 220 GQ(2), MATH 230(4), MATH 250(3) (Sem: 1-4)
E G 010(1), E G 011(1) (Sem: 3-4)
PHYS 201 GN(4), PHYS 202 GN(4) (Sem: 3-6)
E MCH 011(3), E MCH 012(3) (Sem: 5-8)

ADDITIONAL COURSES (6-7 credits)
PHYS 203 GN(3) or PHYS 204 GN(4) (Sem: 3-6)
B.S. requirements[46](3) (Sem: 5-6)

SEMESTERS SEVEN THROUGH TEN (56-57 credits)
Credits required in the selected major in Earth and Mineral Sciences or Engineering (56-57) (Sem: 7-10)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 3 credits from each of the following areas: arts, humanities, science/mathematics, social and behavioral sciences. (Sem: 9-10)

[44] Enrollment in the Engineering Science program is limited to those students attaining an average of B or higher during their first six semesters and to those specially chosen by the College of Engineering faculty on the basis of evidence that they will benefit from the advanced courses.

[45] Concurrent Degree candidates should consult the individual program requirements in the College of Engineering and the College of Earth and Mineral Sciences to ascertain which combinations of CHEM, E G, E MCH, MATH, and PHYS are required.

[46] Concurrent Degree candidates should select a course in this category appropriate for the requirements for their program in either Earth and Mineral Sciences or Engineering.

MANAGEMENT

Smeal College of Business

This major provides students with knowledge and skills that general managers need to deal with contemporary challenges, such as those related to leading and motivating people, designing organizational structures, and balancing the interest of multiple stakeholders in a complex political, legal, and ethical environment. The management core provides a general overview of the required knowledge and skills required for effectively managing people and organizations. Students then supplement that overview with either the human resources management concentration or the global and strategic management concentration.

The human resources management concentration prepares students for a professional career in human resources management, and develops skills and expertise in areas such as planning, staffing, job design, employee development, performance management, compensation, change management, and managing diversity.

The global and strategic management concentration provides students with broad knowledge about managing in a global competitive environment. In addition, students choose an area of expertise from outside the major. This concentration prepares students for career opportunities in managerial and staff positions that utilize the specialized knowledge and skills developed in the supporting area or minor.

For the B.S. degree in Management, a minimum of 120 credits is required (at least 15 credits must be taken at the 400 level).

GENERAL EDUCATION: 45 credits
(15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 12-14 credits

REQUIREMENTS FOR THE MAJOR: 76-78 credits
(This includes 15 credits of General Education courses: 3 credits of GWS courses; 6 credits of GQ courses; 6 credits of GA, GH, or GS courses.)

PRESCRIBED COURSES (37 credits)
ACCTG 211(4), CMPSC 203 GQ(4), ECON 002 GS(3), ECON 004 GS(3) (Sem: 1-4)
B A 301(2), B A 302(2), B A 303(2), B A 304(2), B A 411(3), ENGL 202D GWS(3), MGMT 326(3)[1], MGMT 341(3)[1], MGMT 451W(3)[1] (Sem: 7-8)

ADDITIONAL COURSES (20-25 credits)
MATH 110 GQ(4) or MATH 140 GQ(4) (Sem: 1-2)
MS&IS 200(4) or STAT 200(4) (Sem: 1-2)
M I S 204(2) or IST 110(4) (Sem: 3-4)
B A 243(4) or B A 241(2) and B A 242(2) (Sem: 3-4)
Select 6-9 credits from one of the following areas of concentration:
a. Human Resources Management (9 credits): MGMT 441(3)[1], MGMT 443(3)[1], MGMT 445 GI(3)[1] (Sem: 7-8)
b. Global and Strategic Management (6 credits): MGMT 461(3)[1], MGMT 471(3)[1] (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (16-19 credits)
Select 4 credits: Attainment of 12th-credit-level proficiency in a single foreign language. Proficiency must be demonstrated by either examination or course work (Sem: 1-4)
Select 6 credits of Global Awareness and Understanding from approved course list (credits must be taken in GA, GH, or GS) (Sem: 1-8)
Select 6-9 credits of supporting course work from one of the following areas to compliment the same area of concentration above:
a. Human Resources Management (6 credits): Select 6 credits of supporting course work from a department list or from a University-approved Minor (Sem: 5-8)
b. Global and Strategic Management (9 credits): Select 9 credits of supporting course work (at least 3 credits at the 400 level) from a department list or from a University-approved minor (Sem: 5-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

MANAGEMENT

Captial College

This major is designed for students who are interested in careers in management and learning problem-solving skills that will enable them to make sound decisions within a changing business environment. The program emphasizes current practices and technical competence, which provides students with skills to organize,

establish goals, and control activities. Each student's background is complemented with basic business instruction in accounting, marketing, information systems, and finance. Because the Harrisburg area is the center of industry and economic development for south-central Pennsylvania, students are provided with many opportunities to experience the world of business.

For a B.S. degree in Management, a minimum of 122 credits is required. At least 50 percent of the business credit hours required for the degree must be taken at the Capital College. No more than 61 credits should be from business and business-related courses.

ENTRY TO MAJOR REQUIREMENTS: Entry to the Management major requires the completion of 9 entry-to-major courses: ENGL 015 GWS(3) or ENGL 030 GWS(3), MATH 110 GQ(4) or MATH 140 GQ(4), ACCTG 211(4), CMPSC 203 GQ(4) or M I S 103(3), M I S 204(2), STAT 200 GQ(4) or MS&IS 200 (4), ECON 002 GS(3), ECON 004 GS(3), B A 243(4) and a 2.00 or higher cumulative grade-point average. Additional information about this major is available in the office of the Director of Undergraduate Studies, School of Business Administration at Penn State Harrisburg.

GENERAL EDUCATION: 45 credits
(10-12 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: Select 5-8 credits of non-business courses.

REQUIREMENTS FOR THE MAJOR: 81-82 credits
(This includes 10-12 credits of General Education Courses: 3 credits of GWS courses; 3 credits of GS courses; 4-6 credits of GQ courses.)

PRESCRIBED COURSES (49 credits)
ACCTG 211(4), M I S 204(2), B A 243(4) (Sem: 1-4)
ECON 002 GS(3), ECON 004 GS(3) (Sem: 1-4)
ENGL 202D GWS(3) (Sem: 3-4)
BUS 361(3), BUS 364W GI(3), BUS 462(3)[1], FINAN 320(3), INFSY 390(3), MRKT 370(3), MNGMT 310(3)[1], MNGMT 450(3)[1], MNGMT 463(3)[1], MNGMT 480(3)[1] (Sem: 5-8)

ADDITIONAL COURSES (20-21 credits)
Select 3-4 credits from M I S 103(3) or CMPSC 203 GQ(4) (Sem: 1-4)
Select 4 credits from MATH 110 GQ(4) or MATH 140 GQ(4) (Sem: 1-4)
Select 4 credits from MS&IS 200(4) or STAT 200 GQ(4) (Sem: 1-4)
Select 9 credits[1] from the following: H C M 361(3), H C M 462(3), MNGMT 441(3), MNGMT 442(3), MNGMT 451(3), MNGMT 460(3), MNGMT 461(3), MNGMT 489(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 12 credits from 200-400 level business courses from: ACCT, BUS, ECNMS, FINAN, INFSY, MNGMT, or MRKT in consultation with an academic adviser and in support of the student's interests. (Sem: 3-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

MANAGEMENT

Penn State Erie, The Behrend College

The objective of the Management major is to prepare students for the basic tasks of management—the coordination of human, material, and financial resources to accomplish organizational goals. Two options are offered.

The General Management option helps prepare students for careers in personnel administration or a variety of general management positions. This option emphasizes knowledge relating to managing human resources but students also can select supporting business courses in other disciplines to prepare themselves to become managers of small businesses or units of larger business organizations, frequently in retail or service businesses.

The Operations Management option provides students with an opportunity to develop the quantitative skills necessary to design and operate today's complex management systems. This option emphasizes course work in forecasting, production and inventory planning control, logistics, purchasing, and materials management. Students also can select from a special supporting course concentration in analytical methods and manufacturing processes to better prepare themselves for careers in manufacturing organizations.

For the B.S. degree in Management, a minimum of 125 credits is required. Each student must earn at least a grade of C in each 300- and 400-level course in the major field.

GENERAL EDUCATION: 45 credits
(15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 1 credit

REQUIREMENTS FOR THE MAJOR: 94 credits
(This includes 15 credits of General Education courses: 6 credits of GQ courses; 6 credits of GS courses; 3 credits of GWS courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 61 credits

PRESCRIBED COURSES (54 credits)
CMPSC 203 GQ(4) (Sem: 1-2)
ACCTG 211(4), B A 243(4), ECON 002 GS(3), ECON 004 GS(3), ENGL 202D GWS(3), M I S 204(2), MS&IS 200(4) (Sem: 3-4)
FNC 300(3), L I R 100 GS(3), MANGT 300(3), MANGT 310(3), MANGT 330(3), MANGT 340 GI(3), MANGT 350(3), MRKTG 300(3) (Sem: 5-6)
MANGT 470W(3) (Sem: 7-8)

ADDITIONAL COURSES (7 credits)
MATH 110 GQ(4) or MATH 140 GQ(4) (Sem: 1-2)
Select 3 credits from ECNS 470(3), MANGT 480 GI(3), MRKTG 470 GI(3), or other 400-level international business courses (Sem: 5-8)

REQUIREMENTS FOR THE OPTION: 33 credits

GENERAL MANAGEMENT OPTION: 33 credits

ADDITIONAL COURSES (9 credits)
Select 9 credits from ECNS 410(3), ECNS 430(3), MANGT 420(3), or MANGT 440(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (24 credits)
Select 9 credits of 300- or 400-level courses from one business supporting course area (see school list of approved courses) (Sem: 5-8)
Select 15 credits from one of the following nonbusiness supporting course areas: international studies, education abroad, or foreign language (see school list of approved courses) (See the admission section in the general information section in the front of Bulletin for the placement policy for Penn State foreign language courses.) (Sem: 1-8)

OPERATIONS MANAGEMENT OPTION: 33 credits

PRESCRIBED COURSES (12 credits)
ECNS 460(3), MANGT 450(3), MANGT 455(3), MANGT 460(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (21 credits)
Select 6 credits of 300- or 400-level courses from one business supporting course area (see school list of approved courses) (Sem: 5-8)
Select 15 credits from one of the following nonbusiness supporting course areas: international studies, education abroad, foreign language, or analytical methods and manufacturing processes (see school list of approved courses) (See the admission section in the general information section in the front of Bulletin for the placement policy for Penn State foreign language courses.) (Sem: 1-8)

MANAGEMENT INFORMATION SYSTEMS

Penn State Erie, The Behrend College

This major offers students a business degree coupled with strong computer and information management skills. Management Information Systems differs from computer science in several ways. In Management Information Systems, the emphasis is on the solution of business problems rather than on the creation of new knowledge about computing. Where computer science emphasizes the study of computers and computer programming as ends in themselves, Management Information Systems emphasizes the application of information technology

within an organization to help achieve its goals. Skills include the analysis of information management needs, design of systems, and practical technical knowledge, including database management, communications, and programming. The major adheres to the Association for Computing Machinery's curriculum recommendations, as well as to the guidelines proposed by the Data Processing Management Association's model curriculum.

Graduates in this field may find employment opportunities with large and small organizations in both the public and private sectors. Typical entry-level positions include programmer/analyst, user support specialist, or database analyst. Long-term career opportunities include manager of information services, chief information officer, partner in a consulting firm, and executive-level management. Management Information Systems graduates are regarded as assets to a firm because they have the necessary skills both to understand business problems and to apply appropriate technology to gain strategic advantage.

For the B.S. degree in Management Information Systems, a minimum of 126 credits is required. Each student must earn at least a grade of C in each 300- and 400-level course in the major field.

GENERAL EDUCATION: 45 credits
(15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 1 credit

REQUIREMENTS FOR THE MAJOR: 95 credits
(This includes 15 credits of General Education courses: 6 credits of GQ courses; 6 credits of GS courses; 3 credits of GWS courses.)

PRESCRIBED COURSES (58 credits)
CMPSC 203 GQ(4) (Sem: 1-2)
ACCTG 211(3), B A 243(4), CMPBD 240(4), ECON 002 GS(3), ECON 004 GS(3), ENGL 202D GWS(3), M I S 204(2), MS&IS 200(4) (Sem: 3-4)
CMPBD 350(3), FNC 300(3), MANGT 300(3), MANGT 310(3), MISBD 336(3), MISBD 430(4), MRKTG 300(3) (Sem: 5-6)
MANGT 470W(3), MISBD 435(3) (Sem: 7-8)

ADDITIONAL COURSES (13 credits)
MATH 110 GQ(4) or MATH 140 GQ(4) (Sem: 1-2)
CMPSC 140(3) or M I S 110(3) (Sem: 5-6)
MISBD 494(3) or MISBD 495(3) (Sem: 7-8)
Select 3 credits form ECNS 470(3), MANGT 480 GI(3), MRKTG 470 GI(3), or other 400-level international business courses (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (24 credits)
Select 6 credits of 300- or 400-level courses in CMPBD,CMPSC, or MISBD in consultation with adviser (see school list of approved courses) (Sem: 5-8)
Select 3-6 credits from COMMU 325, 300- or 400-level MISBD, or other business supporting course areas (see school list of approved courses) (Sem: 5-8)
Select 12-15 credits from one of the following nonbusiness supporting course areas: international studies, education abroad, foreign language, or quantitative methods (see school list of approved courses) (See the admission section in the general information section in the front of this bulletin for the placement policy for Penn State foreign language courses.) (Sem: 1-8)

MANAGEMENT INFORMATION SYSTEMS

Smeal College of Business

Students in the M I S major learn about managing business information systems within organizations and spanning supply chain networks. The courses provide students with the depth and breadth to become effective managers of information systems that support core business processes. After receiving a thorough grounding in the core elements of business, students develop knowledge, skills, and abilities in programming, information resource management, managing the IT portfolio, business process reengineering, and use of telecommunication and Internet technologies to manage core business processes. Examples of career opportunities include IT manager, business process reengineering specialist, business systems analyst, and business application developer.

For the B.S. degree in Management Information Systems, a minimum of 120 credits is required (at least 15 credits must be taken at the 400 level).

GENERAL EDUCATION: 45 credits
(15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 12-14 credits

REQUIREMENTS FOR THE MAJOR: 76-78 credits
(This includes 15 credits of General Education: 3 credits of GWS courses; 6 credits of GQ courses; and 6 credits of GA, GH or GS courses.)

PRESCRIBED COURSES (46 credits)
ACCTG 211(4), CMPSC 203 GQ(4), ECON 002 GS(3), ECON 004 GS(3) (Sem: 1-4)
B A 301(2), B A 302(2), B A 303(2), B A 304(2), M I S 301(3)[1], M I S 431(3)[1], M I S 432(3)[1], ENGL 202D GWS(3), B A 411(3) (Sem: 5-6)
M I S 434(3)[1], M I S 436(3)[1], M I S 479W(3)[1] (Sem: 7-8)

ADDITIONAL COURSES (14-16 credits)
MATH 110 GQ(4) or MATH 140 GQ(4) (Sem: 1-2)
MS&IS 200(4) or STAT 200(4) (Sem: 1-2)
M I S 204(2)[1] or IST 110(4)[1] (Sem: 3-4)
B A 243(4) or B A 241(2) and B A 242(2) (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (16 credits)
Select 4 credits: Attainment of 12th-credit-level proficiency in a single foreign language. Proficiency must be demonstrated by either examination or course work. (Sem: 1-4)
Select 6 credits of Global Awareness and Understanding from approved course list (credits must be taken in GA, GH, or GS). (Sem: 1-8)
Select 6 credits of supporting course work. See department list. (Sem: 5-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

MARKETING

Smeal College of Business

This major provides professional education leading to positions in business, government, and other organizations, and helps prepare the student for advanced study at the graduate level. Career opportunities are in marketing management, sales management, advertising, marketing research, retailing, public policy, and consumer affairs. In addition to following a planned course sequence in general marketing management, the students may elect course work that focuses on their interests in consumer or business-to-business marketing, physical goods or services marketing, and for-profit or not-for-profit marketing.

The Marketing major is designed to be integrated with the college's professional education in business administration and builds on that program and on education in the social sciences.

For the B.S. degree in Marketing, a minimum of 120 credits is required (at least 15 credits must be taken at the 400 level).

GENERAL EDUCATION: 45 credits
(15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 12-14 credits

REQUIREMENTS FOR THE MAJOR: 76-78 credits
(This includes 15 credits of General Education courses: 3 credits of GWS courses; 6 credits of GQ courses; and 6 credits of GA, GH, or GS courses.)

PRESCRIBED COURSES (40 credits)
ACCTG 211(4), CMPSC 203 GQ(4), ECON 002 GS(3), ECON 004 GS(3) (Sem: 1-4)

B A 411(3), ENGL 202D GWS(3), MKTG 445(I B) GI(3)[1] (Sem: 5-6)
B A 301(2), B A 302(2), B A 303(2)[1], B A 304(2), MKTG 330(3)[1], MKTG 342(3)[1] (Sem: 6)
MKTG 450W(3)[1] (Sem: 7-8)

ADDITIONAL COURSES (20-22 credits)
MATH 110 GQ(4) or MATH 140 GQ(4) (Sem: 1-2)
MS&IS 200(4) or STAT 200(4) (Sem: 1-2)
M I S 204(2) or IST 110(4) (Sem: 3-4)
B A 243(4) or B A 241(2) and B A 242(2) (Sem: 3-4)
Select 6 credits[1] from MKTG 416(3), MKTG 422(3), MKTG 426(3), MKTG 428(3), MKTG 435(3), MKTG 437(3), MKTG 440(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (16 credits)
Select 4 credits: Attainment of 12th credit level proficiency in a single foreign language. Proficiency must be demonstrated by either examination or course work (Sem: 1-4)
Select 6 credits of Global Awareness and Understanding from approved course list (credits must be taken in GA, GH, or GS) (Sem: 1-8)
Select 6 credits of supporting course work. See department list. (Sem: 5-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

MARKETING

Capital College

This major is designed for students interested in careers involving sales, promotion, services, distribution, research, and planning for business and the public sector. The major provides students with key concepts and methods of analysis in marketing. It focuses on understanding customer needs, developing products or services, creating and implementing marketing plans, monitoring customer responses, and projecting marketing activities for the future.

For the B.S. degree in Marketing, a minimum of 122 credits is required. At least 50 percent of the business credit hours required for the degree must be taken at the Capital College. No more than 61 credits should be from business and business-related courses.

ENTRY TO MAJOR REQUIREMENTS: Entry to the Marketing major requires the completion of 9 entry-to-major courses: ENGL 015 GWS(3) or ENGL 030 GWS(3), MATH 110 GQ(4) or MATH 140 GQ(4), ACCTG 211(4), CMPSC 203 GQ(4) or M I S 103(3), M I S 204(2), STAT 200 GQ(4) or MS&IS 200(4), ECON 002 GS(3), ECON 004 GS(3), B A 243(4) and a 2.00 or higher cumulative grade-point average. Additional information about this major is available in the office of the Director of Undergraduate Studies, School of Business Administration at Penn State Harrisburg.

GENERAL EDUCATION: 45 credits
(10-12 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: Select 6-7 credits of non-business courses.

REQUIREMENTS FOR THE MAJOR: 81-82 credits
(This includes 10-12 credits of General Education Courses: 3 credits of GWS courses; 3 credits of GS courses; 4-6 credits of GQ courses.)

PRESCRIBED COURSES (46 credits)
ACCTG 211(4), M I S 204(2), B A 243(4) (Sem: 1-4)
ENGL 202D GWS(3), ECON 002 GS(3), ECON 004 GS(3) (Sem: 1-4)
BUS 361(3), BUS 364W GI(3), BUS 462(3), FINAN 320(3), INFSY 390(3) (Sem: 5-8)
MNGMT 310(3), MRKT 370(3)[1], MRKT 471(3)[1], MRKT 472(3)[1] (Sem: 5-8)

ADDITIONAL COURSES (23-24 credits)
Select 3-4 credits from M I S 103(3) or CMPSC 203 GQ(4) (Sem: 1-4)
Select 4 credits from MATH 110 GQ(4) or MATH 140 GQ(4) (Sem: 1-4)
Select 4 credits from MS&IS 200(4) or STAT 200 GQ(4) (Sem: 1-4)
Select 12 credits [1] from the following: ECNMS 312(3), MRKT 381(3), MRKT 473(3), MRKT 474(3), MRKT 475(3), MRKT 476(3), MRKT 477(3), MRKT 478(3), MRKT 480(3), MRKT 485(3), MRKT 488(3), MRKT 489(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 12 credits from 200-400 level business courses from: ACCT, BUS, ECNMS, FINAN, INFSY, MNGMT, or MRKT in consultation with an academic adviser and in support of the student's interests. (Sem: 3-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

MARKETING

Penn State Erie, The Behrend College

The objective of the Marketing major is to provide professional education to students leading to careers in business, government, and non-profit organizations. Typically, graduates are employed in marketing management, sales management, retailing, marketing research, and brand management. The major provides a solid foundation in marketing practice, such as analyzing and understanding the needs and wants of present and potential customers, designing appropriate product offerings, establishing pricing policies, developing communication strategies, devising efficient distribution strategies, researching marketing data for the above functions, and coordinating marketing programs with other functional areas of business. Because of the tremendous growth in the service sector, the major emphasizes the marketing of services. Marketing majors may also choose from additional business courses that allow greater specialization on quantitative (marketing research) or management perspectives while the non-business supporting courses allow for additional study in written and oral communication, psychology, foreign language, quantitative methods, or international studies.

For the B.S. degree in Marketing, a minimum of 122 credits is required. Each student must earn at least a grade of C in each 300- and 400-level course in the major field.

GENERAL EDUCATION: 45 credits
(15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 1 credit

REQUIREMENTS FOR THE MAJOR: 91 credits
(This includes 15 credits of General Education courses: 6 credits of GQ courses; 6 credits of GS courses; 3 credits of GWS courses.)

PRESCRIBED COURSES (51 credits)
CMPSC 203 GQ(4) (Sem: 1-2)
ACCTG 211(4), B A 243(4), ECON 002 GS(3), ECON 004 GS(3) (Sem: 3-4)
ENGL 202D GWS(3), M I S 204(2), MS&IS 200(4) (Sem: 3-4)
FNC 300(3), MANGT 300(3), MANGT 310(3), MRKTG 300(3), MRKTG 310(3), MRKTG 320(3), MRKTG 330(3) (Sem:5-6)
MANGT 470W(3) (Sem: 7-8)

ADDITIONAL COURSES (19 credits)
MATH 110 GQ(4) or MATH 140 GQ(4) (Sem: 1-2)
Select 3 credits from: ECNS 470, FNC 470, MANGT 480 GI,
MRKTG 470 GI, or other 400-level international business courses (Sem: 5-8)
Select 12 credits from: ECNS 460, ECNS 462, ECNS 485, MANGT 455, MISBD 336,
MRKTG 400, MRKTG 410, MRKTG 420, MRKTG 494, MRKTG 495, or MRKTG 497 (with at least 6 credits from 400-level MRKTG courses) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (21 credits)
Select 18 credits from the following nonbusiness supporting course areas (with at least 12 credits from the same area): education abroad, foreign language, international studies, psychology, quantitative methods, or written and oral communication (Sem: 1-8)
Select 3 credits of 300- or 400-level courses from one business supporting course area (Sem: 5-8)

MATERIALS SCIENCE AND ENGINEERING

College of Earth and Mineral Sciences

The future can be appropriately termed the age of materials. In addition to the traditional engineering applications of metals, ceramics, semiconductors, and polymers, new materials and composites must be developed by materials scientists to aid progress in communications, computing, electronics, biomedicine, transportation, aerospace, defense, and the production and efficient use of energy.

Our curriculum is structured to provide students with a well-rounded engineering education with special emphasis on materials science and engineering that will meet the needs of industry, academia, and government. Specifically, upon graduation, our students will:

—Possess the ability to apply the fundamentals of mathematics and the physical sciences to the development, characterization, and design of and with materials for engineering applications.

—Possess a general knowledge of all classes of engineering materials, with specific expertise in one of the sub-disciplines: ceramics, metals, polymers, and electronic and photonic materials.

—Understand the interrelationships between processing, properties, and performance of materials.

—Have the ability to define problems, to develop and evaluate economically feasible solutions from diverse knowledge databases, and to implement such solutions.

—Possess the ability to perform effectively on cross-functional teams, both within the discipline and in multi-disciplinary settings.

—Be adept at using the modern tools of materials science and engineering including instrumentation for characterizing the structure and properties of materials, and computational hardware and software for analysis, design, and communication.

—Understand the global and societal context of engineering problems, responsibility to their profession and society and the ethics associated with it, and the value of lifelong learning.

To achieve these objectives, students in materials sciences and engineering begin with a background in basic chemistry, mathematics, and physics, which are the foundation for broad-based materials properties, processing, and applications courses. Commencing with their junior year, students take courses in Materials Science and Engineering and specialized courses in one of four options: Ceramic Science and Engineering, Electronic and Photonic Materials, Metals Science and Engineering, or Polymer Science and Engineering.,The curricula integrate classroom instruction and laboratory experience, and culminate in a capstone research and design experience which is documented in the form of a thesis in the senior year.

The curricula for each of the options in Materials Science and Engineering are described in the following sections.

CERAMIC SCIENCE AND ENGINEERING OPTION: This option covers the manufacture and usage of a wide variety of inorganic materials that usually include high temperatures. The program helps prepare students for operating, research, and development positions in all sections of the ceramic industry and for graduate studies. Graduates also find employment in many other industries that use ceramic materials, such as iron and steel, electrical and electronic, energy generation, automotive, aeronautical, and aerospace. Many find employment in industries that manufacture composite materials such as glass-ceramics, metal-ceramics, or glass-metal structures. The B.S. degree in this option is accredited by the Engineering Accreditation Commission of the Accreditation Board of Engineering and Technology (ABET).

For the B.S. degree in Materials Science and Engineering with an option in Ceramic Science and Engineering, a minimum of 127 credits is required.

ELECTRONIC AND PHOTONIC MATERIALS OPTION: This option provides specialized courses dealing with the processing, properties, and performance of semiconductor, optoelectronic, and optical materials and devices. The graduates contribute in the electronics, telecommunications, and computer industries or pursue advanced studies in materials science and engineering. The B.S. degree in this option is accredited by the Engineering Accreditation Commission of the Accreditation Board of Engineering and Technology (ABET).

For the B.S. degree in Materials Science and Engineering with an option in Electronic and Photonic Materials, a minimum of 126.5 credits is required.

METALS SCIENCE AND ENGINEERING OPTION: The metals option provides an opportunity to explore a broad range of both scientific and engineering principles as applied to metals and alloys. A graduate of this option will thus typically apply basic concepts of chemistry, physics, or engineering science to problems concerning the processing or properties of metals. Although metallurgists are often employed by metals-producing industries, an increasingly large fraction are finding employment in a diverse group of industries that use metals, such as those in the electronics or aerospace fields. Many graduates pursue advanced studies. The B.S. degree in this option is accredited by the Engineering Accreditation Commission of the Accreditation Board of Engineering and Technology (ABET).

For the B.S. degree in Materials Science and Engineering with an option in Metals Science and Engineering, a minimum of 126 credits is required.

POLYMER SCIENCE AND ENGINEERING OPTION: This option allows the student to establish a firm foundation in the basic sciences and to apply this knowledge to a study of the synthesis, structure, and physical properties of synthetic and natural polymers.

Polymers are a major class of materials consisting of macromolecules of very high molecular weight. Polymers are pervasive in today's technological society and find numerous applications in such diverse fields as plastics, elastomers (rubber), adhesives, surface coatings (paints), biomaterials, textiles, paper, packaging, and composite materials.

This option helps prepare graduates for research, development, and technical sales positions in numerous materials and chemical industries that either produce or utilize polymers; or to proceed to advanced studies in polymer science or related technical fields. The B.S. degree in this option is accredited by the Engineering Accreditation Commission of the Accreditation Board of Engineering and Technology (ABET).

For the B.S. degree in Materials Science and Engineering with an option in Polymer Science and Engineering, a minimum of 126 credits is required.

GENERAL EDUCATION: 45 credits
(24 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin. Note: The Accreditation Board for Engineering and Technology (ABET) does not permit the use of skills courses to satisfy the Arts category of General Education.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 105-107 credits
(This includes 24 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 9 credits of GWS courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 57 credits

PRESCRIBED COURSES (51 credits)
CHEM 012 GN(3), CHEM 013 GN(3), CHEM 014 GN(1), CHEM 015 GN(1), EM SC 100S GWS(3)[71], MATH 140 GQ(4), MATH 141 GQ(4) (Sem: 1-2)
ENGL 202C GWS(3), PHYS 211 GN(4), PHYS 212 GN(4), PHYS 214 GN(2) (Sem: 1-4)
MATSE 201(3)[1] (Sem: 3-6)
IE 424(3), MATSE 400(3), MATSE 401(3), MATSE 430(3), MATSE 460(1), MATSE 493W(1), MATSE 494W(2) (Sem: 5-8)

ADDITIONAL COURSES (6 credits)
ENGL 015 GWS(3) or ENGL 030 GWS(3) (Sem: 1-2)
CMPSC 201C GQ(3) or CMPSC 201F GQ(3) (Sem: 3-4)

REQUIREMENTS FOR THE OPTIONS: 48-50 credits

CERAMIC SCIENCE AND ENGINEERING OPTION: 49-50 credits

PRESCRIBED COURSES (34 credits)
MATH 251(4) (Sem: 3-4),
MATSE 402(3), MATSE 410(3)[1], MATSE 413(3), MATSE 436(3), MATSE 466(0.5) (Sem: 5-6)
MATSE 490(1), MATSE 411(3), MATSE 412(3), MATSE 415(3), MATSE 417(3), MATSE 435(3), MATSE 467(0.5), MATSE 468(1) (Sem: 7-8)

ADDITIONAL COURSES (9-10 credits)
E MCH 011(3), E MCH 013(3); or E MCH 210(5) (Sem: 3-4)
MATH 220 GQ(2), MATH 231(2); or MATH 230(4) (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits in consultation with adviser (Students may apply 6 credits of ROTC.) (Sem: 5-8)

ELECTRONIC AND PHOTONIC MATERIALS OPTION: 48.5-49.5 credits

PRESCRIBED COURSES (30.5 credits)
MATH 251(4) (Sem: 3-4)
E E 418(3), E SC 314(3), MATSE 402(3)[1], MATSE 413(3), MATSE 435(3) (Sem: 5-6)
MATSE 417(3), MATSE 450(3), MATSE 455(3), MATSE 463(1), MATSE 469(0.5), MATSE 490(1) (Sem: 7-8)

ADDITIONAL COURSES (9-10 credits)
E MCH 011(3), E MCH 013(3); or E MCH 210(5) (Sem: 3-4)
MATH 220 GQ(2), MATH 231(2); or MATH 230(4) (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 9 credits in consultation with adviser (Students may apply 6 credits of ROTC.) (Sem: 5-8)

METALS SCIENCE AND ENGINEERING OPTION: 48 credits

PRESCRIBED COURSES (32-33 credits)
MATH 251(4) (Sem: 3-4)
MATSE 310W(2), MATSE 402(3)[1], MATSE 423(4)[1], MATSE 436(3), MATSE 471(1) (Sem: 5-6)
MATSE 417(3), MATSE 421(2-3), MATSE 422(3), MATSE 425(3), MATSE 426(3), MATSE 472(1) (Sem: 7-8)

ADDITIONAL COURSES (9-10 credits)
E MCH 011(3), E MCH 013(3); or E MCH 210(5) (Sem: 3-4)
MATH 220 GQ(2), MATH 231(2); or MATH 230(4) (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits of technical courses from department list. At least 3 credits must be in MATSE and 3 credits must be in the engineering sciences. (Students may apply 6 credits of ROTC.) (Sem: 5-8)

POLYMER SCIENCE AND ENGINEERING OPTION: 48 credits

PRESCRIBED COURSES (36 credits)
MATH 231(2), MATH 250(3) (Sem: 3-4)
CHEM 036(2), CHEM 038(3), CHEM 039(3) (Sem: 3-6)
MATSE 441(3)[1], MATSE 443(3)[1], MATSE 436(3), MATSE 444(3), MATSE 447(3) (Sem: 5-8)
MATSE 445(3), MATSE 473(1), MATSE 448(3), MATSE 490(1) (Sem: 5-8)

ADDITIONAL COURSES (3 credits)
Select 3 credits from MATSE 402(3), MATSE 404(3), MATSE 413(3), MATSE 435(3), or MATSE 455(3) (Sem: 5-6)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 9 credits technical electives from department list. At least 3 credits must be in MATSE and 3 credits in the engineering sciences. (Students may apply 6 credits to ROTC.) (Sem: 5-8)
NOTE: Engineering students are expected to take at least one sequence of humanities, social science, or arts courses of either 6 or 9 credits that culminates in a higher-level course. Humanities, arts, and social science courses should compose an integral part of the engineering program and not be limited to a selection of unrelated introductory courses. Close consultation with advisers on these issues is warranted.
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
[71] The following substitutions are allowed for students attending campuses where the indicated course is not offered: CAS 100 GWS or ENGL 202C GWS can be substituted for EM SC 100S GWS.

MATHEMATICAL SCIENCES

Capital College

The two options and the variety of the course offerings provide concentrations in various areas such as actuarial science, management science/operation research, statistics, and preparation for graduate studies.

Small classes, excellent faculty, opportunities to work with faculty on projects, and strong employment prospects are just some of the strengths of the program. Students will be helped to develop: a solid foundation in mathematical studies; an awareness of the utility of mathematics, statistics, and computers; skills in translating practical problems into mathematical terms; a competency in the use of modern mathematical tools; problem-solving skills; and an awareness of the importance of mathematics in society.

The program is designed to prepare students for employment in business, industry, and government immediately after graduation, but graduate study in mathematics or related disciplines is also a viable alternative. Mathematical modeling is emphasized, and all students are required to take courses in statistics and computer science.

For a B. S. degree in Mathematical Sciences, a minimum of 120 credits is required.

For a B. S. degree in Mathematical Sciences with the Secondary Education option, a minimum of 123 credits is required.

ENTRY TO MAJOR REQUIREMENTS: Entry to the Mathematical Sciences major requires that the student has completed: MATH 140 GQ(4), MATH 141 GQ(4). A 2.00 or higher cumulative grade-point average is required. Entry to the Mathematical Sciences Secondary Education option requires a cumulative grade-point average of 3.0. Students must complete, with a grade of "C" or higher, six (6) credits of college-level mathematics, three (3) credits of college-level English literature, and three (3) credits of college-level English composition. (See also Teacher Education Programs.)

SELECTIVE RETENTION (Secondary Education option): Prior to the end of the first semester at Penn State Harrisburg, students will be required to submit scores on the PRAXIS I examinations in reading, writing, and mathematics.

GENERAL EDUCATION: 45 credits
(9 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 5 credits

REQUIREMENTS FOR THE MAJOR: 79 credits
(This includes 9 credits of General Education courses: 3 credits of GWS courses; 6 credits of GQ courses.)

COMMON REQUIREMENTS FOR THE MAJOR (BOTH OPTIONS): 45 credits

PRESCRIBED COURSES (39 credits)
MATH 140 GQ(4), MATH 141 GQ(4) (Sem: 1-2)
ENGL 202C GWS(3) (Sem: 3-4)
SSET 295(1) (Sem: 4)
COMP 350(3), COMP 351(3) (Sem: 5-6)
MA SC 370(3)[1], MA SC 422(3), MA SC 440(3), MA SC 450(3)[1], MA SC 460(3)[1], MA SC 461(3)[1], MA SC 475 DF(3) (Sem: 5-6)

ADDITIONAL COURSES (7 credits)
Select 7 credits from the following: MATH 017 GQ(3), MATH 040 GQ(5), MATH 041 GQ(3), MATH 220 GQ(2), MATH 230(4), MATH 231(2), MATH 232(2), MATH 250(3), MATH 251(4), MATH 311W(3), or STAT 200 GQ(4) (Sem: 1-4)

REQUIREMENTS FOR THE OPTION: 33 credits

GENERAL MATHEMATICAL SCIENCES OPTION: 33 credits

PRESCRIBED COURSES (15 credits)
COMP 401(3)[1], MA SC 420(3), MA SC 423(3), MA SC 425(3), MA SC 477(3) (Sem: 7-8)

ADDITIONAL COURSES (18 credits)
Select 9 credits from: COMP 410(3), COMP 414(3), COMP 419(3) or MA SC 421(3), MA SC 427(3), MA SC 435(3), MA SC 436(3), MA SC 437(3), MA SC 441(4), MA SC 445(3), MA SC 455(3), MA SC 457(3), MA SC 465(3) (Sem: 5-8)
Select 9 credits of 300-400 level courses in consultation with an academic adviser and in support of the student's interests. (Sem: 5-8)

SECONDARY EDUCATION IN MATHEMATICAL SCIENCES OPTION: 33 credits

PRESCRIBED COURSES (27 credits)
EDUC 314(3), EDUC 315 GI(3) (Sem: 5-6)
MA SC 445(3) (Sem: 5-6)
EDUC 385(3), EDUC 417(3), EDUC 490(1-12)[2] (Sem: 7-8)

ADDITIONAL COURSES (6 credits)
Select 3 credits of 300-400 level courses in consultation with an academic adviser and in support of the student's interests. (Sem: 5-8)
Select 3 credits from MA SC 425(3) or MA SC 477(3) (Sem: 7-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.
[2] A minimum GPA of 2.50 in all previous work is required for admission to EDUC 490.

MATHEMATICS

Penn State Erie, The Behrend College

This major builds a foundation in mathematics with emphasis on the applications of mathematics and to the development of problem-solving skills. The major has five options that share a common core of mathematics courses for the first two years. The options are Applied Mathematics, Business, Computer Science, General Mathematics, and Mathematics Education Pre-Certification. They allow students to concentrate on developing mathematical skills suitable either for entry level positions in areas including applied mathematics, actuarial sciences, statistics, computer programming, and education, or for graduate studies in mathematics and related fields. Students, with the assistance of a faculty adviser, should select an option in their sophomore year.

For the B.S. degree in Mathematics, a minimum of 120 credits is required. Each student must earn at least a grade of C in each 300- and 400-level course in the major field.

GENERAL EDUCATION: 45 credits
(17-23 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES)

INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selections)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 0-11 credits

REQUIREMENTS FOR THE MAJOR: 87-94 credits
(This includes 17-23 credits of General Education courses: 8 credits of GN courses; 6 credits of GQ courses; 0-6 credits of GS courses; 3 credits of GWS courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 51 credits

PRESCRIBED COURSES (43 credits)
CSE 103 GQ(4)[1], MATH 140 GQ(4)[1], MATH 141 GQ(4)[1] (Sem: 1-2)
CSE 120 GQ(3)[1], CMPBD 127(1), MTHBD 315W(4) (Sem: 3-4)
STABD 303(3) (Sem: 3-6)
MATH 220 GQ(2)[1], MATH 230(4)[1], MATH 251(4)[1] (Sem: 3-8)
ENGL 202C GWS(3) (Sem: 5-6)
MTHBD 420(3), STABD 404(3) (Sem: 5-8)

ADDITIONAL COURSES (8 credits)
Select 8 credits in one of the following sequences:
a. BIOL 110 GN(4), BIOL 220W GN(4)(Sem: 1-4)
b. CHEM 012 GN(3), CHEM 013 GN(3), CHEM 014 GN(l), CHEM 015 GN(l) (Sem: 1-4)
c. PHYS 211 GN(4), PHYS 212 GN(4) (Sem: 1-4)
d. PHYS 250 GN(4), PHYS 251 GN(4) (Sem: 1-4)

REQUIREMENTS FOR THE OPTION: 36-43 credits

APPLIED MATHEMATICS OPTION: 36 credits

ADDITIONAL COURSES (27 credits)
Select 15 credits from MISBD 430(3), MTHBD 423(3), MTHBD 424(3), MTHBD 425(3), MTHBD 428(3), MTHBD 446(3), STABD 443(3), STABD 444(3), STAT 414(3), STAT 415(3) (Sem: 5-8)
Select 6 credits from: CMPBD 350(3), CMPBD 410(3), CMPBD 411(3), CMPBD 440(3), CMPBD 450(3), CMPBD 460(3), CSE 231(3), CSE 260(3) (Sem: 3-8)
Select 6 credits from MTHBD 422(3), MTHBD 431(3), MTHBD 432(3), MTHBD 434(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 9 credits from a school-approved list (Sem: 3-8)

BUSINESS OPTION: 42 credits
(A maximum of 30 credits through the School of Business may be used to fulfill this requirement. This includes all courses taken for General Education, prescribed, additional, supporting and related areas, and electives.)

PRESCRIBED COURSES (12 credits)
ACCTG 211(4), ECON 002 GS(3), ECON 004 GS(3) (Sem: 1-6)
M I S 204(2) (Sem: 3-6)

ADDITIONAL COURSES (24 credits)
Select 6 credits from ECNS 460(3), FNC 300(3), INS 301(3), MANGT 300(3), MANGT 310(3), MANGT 330(3), MANGT 340 GI(3), or MRKTG 300(3) (Sem: 3-8)
Select 6 credits from CMPBD 210(3), CMPBD 217(3), CMPBD 350(3), CMPBD 401(3), CMPBD 423(3), CMPBD 424(3), CMPBD 440(3), CMPBD 450(3) (Sem: 3-8)
Select 6 credits from MISBD 336(3), MISBD 430(3), MISBD 435(3), MISBD 440(3), MISBD 445(3), STABD 443(3), STABD 444(3) (Sem: 3-8)
Select 6 credits from MTHBD 422(3), MTHBD 431(3), MTHBD 432(3), MTHBD 434(3), MTHBD 450(3), MTHBD 477(3) (Sem: 3-8)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits from a school-approved list (Sem: 3-8)

COMPUTER SCIENCE OPTION: 36 credits

PRESCRIBED COURSES (15 credits)
CSE 231(3), CSE 260(3) (Sem: 3-6)
CMPBD 410(3), CMPBD 423(3), CMPBD 440(3) (Sem: 5-8)

ADDITIONAL COURSES (9 credits)
Select 9 credits from CMPBD 350(3), CMPBD 411(3), CMPBD 424(3), CMPBD 450(3), CMPBD 460(3) (Sem: 3-8)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 12 credits from a school-approved list (Sem: 3-8)

GENERAL MATHEMATICS OPTION: 36 credits

ADDITIONAL COURSES (24 credits)
Select 18 credits from MTHBD 422(3), MTHBD 423(3), MTHBD 424(3), MTHBD 425(3), MTHBD 428(3), MTHBD 431(3), MTHBD 432(3), MTHBD 434(3), MTHBD 450(3), MTHBD 475(3), MTHBD 477(3), STABD 443(3), STABD 444(3), STAT 414(3), STAT 415(3), CSE 260(3) (Sem: 3-8)
Select 6 credits from MTHBD 422(3), MTHBD 431(3), MTHBD 432(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 12 credits from a school-approved list (Sem: 3-8)

MATHEMATICS EDUCTION PRE-CERTIFICATION OPTION: 43 credits
(This option is designed especially for students who are interested in pursuing further studies with emphasis on education, or plan to enter a teacher certificate program. Current affiliation is with Mercyhurst College, Erie, Pa.)

PRESCRIBED COURSES (16 credits)
PSY 002 GS(3), PSY 213 GS(3), or HD FS 129 GS(3) (Sem 3-8)
MTHBD 423(3), MTHBD 450(3), MTHBD 477(3), MTHBD 478(1) (Sem: 5-8)

ADDITIONAL COURSES (18 credits)
Select 12 credits from MTHBD 422(3), MTHBD 424(3), MTHBD 425(3), MTHBD 428(3), MTHBD 431(3), MTHBD 432(3), MTHBD 434(3), MTHBD 475(3), STABD 443(3), STABD 444(3), STAT 414(3), STAT 415(3) (Sem: 3-8)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 9 credits from a school-approved list (Sem: 3-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

MATHEMATICS, B.A.

Altoona College; Eberly College of Science

Two degrees are offered in mathematics: the Bachelor of Arts and the Bachelor of Science. Both programs have a common core of mathematics courses; both programs prepare students for graduate work in mathematics. In addition, the Bachelor of Arts degree is oriented toward applications of mathematics in the arts, humanities, and social sciences. The Bachelor of Science degree has a number of options. These options are oriented toward actuarial science, applied analysis, computational mathematics, graduate study, systems analysis, and teaching.

Many of the options are designed for students who want to use mathematics in industry, commerce, or government. In short, the degree requirements have the flexibility to fit many individual interests. The student, with the assistance of a faculty adviser, should select an option by the end of the sophomore year.

In order to be eligible for entrance to the Mathematics major, a student must have: 1) attained at least a 2.00 cumulative grade point average; and 2) completed MATH 140 GQ(4) and MATH 141 GQ(4) and earned a grade of C or better in each of these courses.

For the B.A. degree in Mathematics, a minimum of 120 credits is required.

GENERAL EDUCATION: 45 credits
(6 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selections)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION or BACHELOR OF ARTS DEGREE REQUIREMENTS course selections)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 1 credit

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 56 credits
(This includes 6 credits of General Education GQ courses.)

PRESCRIBED COURSES (23 credits)
MATH 140 GQ(4)[1], MATH 141 GQ(4)[1], MATH 220 GQ(2), MATH 230(4), MATH 311W(3)[1], MATH 312(3)[1] (Sem: 1-4)
MATH 403(3)[1] (Sem: 5-8)

ADDITIONAL COURSES (18-20 credits)
CSE 103 GQ(4) or CMPSC 101 GQ(3) or CMPSC 201C GQ(3) (Sem: 1-2)
MATH 250(3) or MATH 251(4) (Sem: 3-4)
MATH 435(3)[1] or MATH 436(3)[1] (Sem: 5-8)
Select 3 credits[1] from MATH 411(3),MATH 412(3), MATH 417(3), MATH 419(3), or MATH 421(3) (Sem: 5-8)
Select 6 credits[1] of 400-level MATH courses except MATH 401(3), MATH 405(3), MATH 406(3), MATH 441(3), MATH 470(3), MATH 471(4) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (13-15 credits)
Select 13-15 credits from department list (Sem: 3-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

MATHEMATICS, B.S.

Altoona College; Eberly College of Science

Two degrees are offered in mathematics: the Bachelor of Arts and the Bachelor of Science. Both programs have a common core of mathematics courses; both programs prepare students for graduate work in mathematics. In addition, the Bachelor of Arts degree is oriented toward applications of mathematics in the arts, humanities, and social sciences. The Bachelor of Science degree has a number of options. These options are oriented toward actuarial science, applied analysis, computational mathematics, graduate study, systems analysis, and teaching.

Many of the options are designed for students who want to use mathematics in industry, commerce, or government. In short, the degree requirements have the flexibility to fit many individual interests. The student, with the assistance of a faculty adviser, should select an option by the end of the sophomore year.

In order to be eligible for entrance to the Mathematics major, a student must have: 1) attained at least a 2.00 cumulative grade point average; and 2) completed MATH 140 GQ(4) and MATH 141 GQ(4) and earned a grade of C or better in each of these courses.

For the B.S. degree in Mathematics, a minimum of 120 credits is required.

GENERAL EDUCATION: 45 credits
(6-12 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selections)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 1 credit

REQUIREMENTS FOR THE MAJOR: 80-90 credits
(This includes 6-12 credits of General Education courses: 6 credits of GQ courses. In addition, the Teacher Certification option includes 6 credits of GS courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 26-28 credits

PRESCRIBED COURSES (20 credits)
MATH 140 GQ(4)[53], MATH 141 GQ(4)[53] (Sem: 1-4)
MATH 220 GQ(2)[53], MATH 230(4), MATH 311W(3)[1], MATH 312(3)[1] (Sem: 3-4)

ADDITIONAL COURSES (6-8 credits)[53]
CSE 103 GQ(4)[53] or CMPSC 101 GQ(3)[53] or CMPSC 201C GQ(3)[53](Sem: 1-2)
MATH 250(3) or MATH 251(4) (Sem: 3-4)

REQUIREMENTS FOR THE OPTION: 52-62 credits

ACTUARIAL MATHEMATICS OPTION: 52-54 credits

PRESCRIBED COURSES (33 credits)
I E 425(3), INS 301(3), INS 410(3), INS 411(3), INS 412(3), MATH 414(3)[1], MATH 415(3)[1], MATH 416(3)[1], MATH 451(3)[1], MATH 484(3)[1], STAT 460(3) (Sem: 5-8)

ADDITIONAL COURSES (3 credits)[1]
Select 3 credits from 400-level MATH courses except MATH 401(3), MATH 405(3), MATH 406(3), MATH 441(3), MATH 470(3), MATH 471(4) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (16-18 credits)
Select 8 credits in a foreign language (proficiency demonstrated by examination or course work to the level of the second semester; if fewer than 8 credits are needed to reach the required proficiency, students choose selections from department list to total 8 credits) (Sem: 1-4)
Select 8-10 credits from department list (Sem: 1-8)

APPLIED ANALYSIS OPTION: 52-54 credits

PRESCRIBED COURSES (9 credits)[1]
MATH 403(3), MATH 421(3), MATH 436(3) (Sem: 5-8)

ADDITIONAL COURSES (17 credits)[1]
MATH 414(3) or MATH 418(3) (Sem: 5-8)
Select 6 credits from MATH 411(3), MATH 412(3), or MATH 417(3) (Sem: 5-8)
Select one of the following sequences (8 credits): (Sem: 1-4)
a. BIOL 110 GN(4), BIOL 220W GN(4)
b. CHEM 012 GN(3), CHEM 013 GN(3), CHEM 014 GN(1), CHEM 015 GN(1)
c. PHYS 211 GN(4), PHYS 212 GN(4)

SUPPORTING COURSES AND RELATED AREAS (26-28 credits)
Select 8 credits in a foreign language (proficiency demonstrated by examination or course work to the level of the second semester; if fewer than 8 credits are needed to reach the required proficiency, students choose selections from department list to total 8 credits) (Sem: 1-4)
Select an approved sequence of 12 credits in an area of application; possible areas include engineering and the physical, earth, or biological sciences (Sem: 1-8)
Select 6-8 credits from department list (Sem: 1-8)

COMPUTATIONAL MATHEMATICS OPTION: (52-54 credits)

PRESCRIBED COURSES (21 credits)
CSE 120(3), CSE 231(3) (Sem: 3-4)
MATH 414(3)[1], MATH 415(3)[1], MATH 455(3)[1], MATH 456(3)[1], MATH 484(3)[1] (Sem: 5-8)

ADDITIONAL COURSES (12 credits)[1]
MATH 467(3) or MATH 469(3) (Sem: 5-8)
Select 3 credits from MATH 411(3), MATH 412(3), or MATH 417(3) (Sem: 5-8)
Select 6 credits from CSE 468(3), MATH 310(3), MATH 459(3), MATH 468(3), MATH 483(3), or MATH 485(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (19-21 credits)
Select 8 credits in a foreign language (proficiency demonstrated by examination or course work to the level of the second semester; if fewer than 8 credits are needed to reach the required proficiency, students choose selections from department list to total 8 credits) (Sem: 1-4)
Select 11-13 credits from department list (Sem: 1-8)

GENERAL MATHEMATICS OPTION: 52-54 credits

PRESCRIBED COURSE (3 credits)[1]
MATH 403(3) (Sem: 5-8)

ADDITIONAL COURSES (15 credits)[1]
MATH 414(3) or MATH 418(3); MATH 435(3) or MATH 436(3) (Sem: 5-8)
Select 3 credits from MATH 411(3), MATH 412(3), MATH 417(3), MATH 419(3), or MATH 421(3) (Sem: 5-8)
Select 6 credits of 400-level MATH courses except MATH 401(3), MATH 405(3), MATH 406(3), 441(3), MATH 470(3), MATH 471(4) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (34-36 credits)
Select 8 credits in a foreign language (proficiency demonstrated by examination or course work to the level of the second semester; if fewer than 8 credits are needed to reach the required proficiency, students choose selections from department list to total 8 credits) (Sem: 1-4)
Select an approved sequence of 12 credits in MATH or a related area or an area of application (Sem: 1-8)

Select 14-16 credits from department list (Sem: 1-8)

GRADUATE STUDY OPTION: 52-54 credits

PRESCRIBED COURSES (18 credits)[1]
MATH 403(3), MATH 404(3), MATH 421(3), MATH 429(3), MATH 435(3), MATH 436(3) (Sem: 5-8)

ADDITIONAL COURSES (12 credits)[1]
MATH 414(3) or MATH 418(3) (Sem: 5-8)
Select 9 credits of 400-level MATH courses except MATH 401(3), MATH 405(3), MATH 406(3), MATH 441(3), MATH 470(3), MATH 471(4) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (22-24 credits)
Select 8 credits in a foreign language (proficiency demonstrated by examination or course work to the level of the second semester; if fewer than 8 credits are needed to reach the required proficiency, students choose selections from department list to total 8 credits) (Sem: 1-4)
Select 14-16 credits from department list (Sem: 1-8)

SYSTEMS ANALYSIS OPTION: 52-54 credits

PRESCRIBED COURSES (12 credits)[1]
MATH 414(3), MATH 415(3), MATH 436(3), MATH 484(3) (Sem: 5-8)

ADDITIONAL COURSES (9 credits)[1]
Select 6 credits from MATH 310(3), MATH 451(3), MATH 485(3), or MATH 486(3) (Sem: 5-8)
Select 3 credits from 400-level MATH courses except MATH 401(3), MATH 405(3), MATH 406(3), MATH 441(3), MATH 470(3), MATH 471(4) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (31-33 credits)
Select 8 credits in a foreign language (proficiency demonstrated by examination or course work to the level of the second semester; if fewer than 8 credits are needed to reach the required proficiency, students choose selections from department list to total 8 credits) (Sem: 1-4)
Select an approved sequence of 12 credits in an area of application; possible areas include business, economics, industrial engineering, social sciences (Sem: 1-8)
Select 11-13 credits from department list (Sem: 1-8)

TEACHER CERTIFICATION OPTION: 62 credits[54]
This option helps prepare individuals for mathematics education teaching positions in secondary schools. It includes the academic requirements for the Mathematics Education Instructional I certificate issued by the Pennsylvania Department of Education (see also Teacher Education Programs).

PRESCRIBED COURSES (53 credits)
EDPSY 014(3)[53], EDTHP 115(3) (Sem: 1-2)
HD FS 239 GS(3)[53], PSY 002 GS(3) (Sem: 1-2,5-6)
C I 295(2)[53], C I 412W(3)[53], C I 495C(3)[53][56], C I 495E(15)[53], MATH 427(3)[1], MATH 435(3)[1], MATH 436(3)[1], MTHED 411(3)[53], MTHED 412(3)[53], MTHED 427(3)[53] (Sem: 5-8)

ADDITIONAL COURSES (9 credits)
MATH 310[1] or MATH 483(3)[1]; MATH 414(3)[1] or MATH 418(3)[1] (Sem: 3-8)
Select 3 credits from 400-level EDTHP courses[53] (Sem: 3-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
[53] A grade of C or better per course is required for teacher certification.
[54] Mathematics majors who wish to teach in public schools must schedule the teacher certification requirements prescribed by the College of Education as shown on this page. In addition, they must file an application in the Certification and Education Services Office, 181 Chambers Building, prior to the end of the second semester. At that time, they will be assigned an adviser in the College of Education to help them schedule the appropriate professional course work.
[56] Offered only for Satisfactory/Unsatisfactory grading.

MECHANICAL ENGINEERING

College of Engineering

Mechanical Engineering is the science of understanding, and art of design of mechanisms and engines. Mechanisms are devices composed of solid, fluid, electrical, and optical components that perform specified tasks. Examples include: robots, tape drives, earth movers, clocks, sports equipment, energy-absorbing bumpers, acoustic sensors, low-friction bearings, high-friction brakes, automated inspection equipment, satellite positioners, and artificial hips. Engines are devices that convert (or conserve) thermal and mechanical energy to perform specified tasks. Examples include: internal combusion engines, jet engines, missile launchers, heat

exchangers, refrigerators, ovens, ventilators, pumps, turbines, solar heaters, compressors, hydraulic actuators, insulation and explosively deployed air bags.

The Mechanical Engineering program prepares students for a rewarding career in one of the broadest engineering disciplines. Since the industrial revolution, mechanical engineers have found themselves at the forefront of technology development and applications. The curriculum has been designed to fulfill educational objectives consistent with both the theoretical underpinnings of the field and current industry practice. Specifically, upon graduation, our students will:

—Demonstrate a knowledge of chemistry, physics, and mathematics.

—Be able to apply fundamentals of mathematics, physics and engineering to mechanical engineering analyses and design involving both mechanical and thermal/fluids systems.

—Demonstrate the ability to operate in a modern, diverse working environment in which they will work in multidisciplinary teams, communicate effectively and recognize the global, social and ethical contexts of their work.

—Be able to apply their educational experience to a wide variety of career paths including industry, advanced engineering study, or professional schools, recognizing that in any career path, continuing education and learning are essential.

—Demonstrate the ability to use appropriate information technology for (1) measurement and analysis of data, (2) analysis and design, and (3) presentations and communication.

The program offers a balance of engineering applications and theory with an emphasis on design from the first year through the industry-based capstone design experience in the senior year. In addition, mechanical engineering students find it easy to incorporate co-operative educational experiences as well as many minors into their program.

For the B.S. degree in Mechanical Engineering, a minimum of 137 credits is required. This baccalaureate program in Mechanical Engineering is accredited by the Engineering Accreditation Commission of ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202-4012; telephone 410-347-7700; or **www.abet.org**.

GENERAL EDUCATION: 45 credits
(21 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 113 credits
(This includes 21 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses; 3 credits of GWS courses.)

PRESCRIBED COURSES (82 credits)
CHEM 012 GN(3), ED&G 100(3), MATH 140 GQ(4), MATH 141 GQ(4), PHYS 211 GN(4) (Sem: 1-2)
E MCH 011(3)[1], E MCH 012(3)[1], E MCH 013(3)[1], M E 030(3)[1], MATH 220 GQ(2), MATH 231(2), MATH 251(4), PHYS 212 GN(4), PHYS 214 GN(2) (Sem: 3-4)
E E 305(3), E MCH 215(2), ENGL 202C GWS(3), I E 312(3), M E 031(3)[1], M E 033(3)[1], M E 050(3)[1], M E 051(3)[1], M E 054(3)[1], M E 082(3)[1], MATSE 259(3) (Sem: 5-6)
M E 412(3)[1], M E 440(3)[1] (Sem: 7-8)

ADDITIONAL COURSES (19 credits)
Select 1 credit of First-Year Seminar (Sem: 1-2)
CHEM 013 GN(3), or BIOL 141 GN(3) (Sem: 1-2)
ECON 002 GS(3), ECON 004 GS(3), ECON 014 GS(3), or ENNEC 100 GS(3) (Sem: 1-2)
CMPSC 201C GQ(3) or CMPSC 201F GQ(3) (Sem: 3-4)
I E 424(3), STAT 401(3), STAT 414(3), or STAT 418(3) (Sem: 7-8)
M E 414W(4) or M E 415W(4) (Sem: 7-8)
Select 2 credits from M E 083(1), M E 084(1), M E 085(1), M E 086(1), M E 087(1), or E MCH 216(1) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 3 credits in a 400-level M E Technical Elective (METE) course excluding M E 412, M E 414W, M E 415W, M E 440, M E 494, and M E 496 (Sem: 5-8)
Select 6 credits in 400-level Engineering Technical Elective (ETE) courses (Sem: 5-8)
Select 3 credits in General Technical Elective (GTE) courses from department list (Sem: 7-8)
(Students completing Basic ROTC may substitute 6 of the ROTC credits for 3 credits of ETE and 3 credits of GTE.)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

MECHANICAL ENGINEERING

Penn State Erie, The Behrend College

Built upon a broad foundation in physics, chemistry, and mathematics, this major has the objective of educating graduates to be problem solvers. Graduates of this program will have had opportunities to learn about applying scientific principles, engineering analysis, and engineering design to solve unstructured problems that are typical of those found in mechanical engineering. The major helps prepare graduates for a lifelong productive career, whether they choose professional practice, graduate school, or some other career path. Graduates will have had opportunities to learn how to work with others toward a common goal, to clearly express their ideas in written and verbal form, and to be independent and capable of adapting to the continuously changing technology of the work environment.

After completing the fundamental science core, students may pursue their interest in mechanical engineering by studying fluid and solid mechanics, engineering materials and their properties, thermodynamics and heat transfer, computer-aided design, kinematics and dynamics of machine elements, machine design, finite elements, control systems, electricity, and electronic instrumentation and machinery. The students will be required to analyze and solve a significant mechanical engineering design problem during their senior year.

ENTRANCE REQUIREMENT: In addition to the Carnegie unit and minimum GPA requirements described by University policies, all students applying for entrance to any of the engineering majors at Penn State Erie must have at least a 2.0 cumulative GPA by the end of the semester prior to applying for entrance to the major and have completed, with a minimum grade of C: CHEM 012 GN(3), MATH 140 GQ(4), MATH 141 GQ(4), and PHYSICS 211 GN(4). These courses must be completed by the end of the semester during which the admission to major process is carried out.

For the B.S. degree in Mechanical Engineering, a minimum of 132 credits is required. Each student must earn at least a grade of C in each 300- and 400-level course in the major field.

GENERAL EDUCATION: 45 credits
(21 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 108 credits
(This includes 21 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses; 3 credits of GWS courses.)

PRESCRIBED COURSES (91 credits)
CHEM 012 GN(3), CHEM 014 GN(1), BDENG 100S(3) (Sem: 1-2)
E MCH 011(3)[1], E MCH 012(3)[1], E MCH 013(3)[1], MATH 140 GQ(4)[1], MATH 141 GQ(4)[1], MATH 220(2), MATH 230(4), MATH 251(4)[1], PHYS 211 GN(4)[1], PHYS 212(4), E E 220(3) (Sem: 1-4)
ENGL 202C GWS(3) (Sem: 3-6)
M E 030(3)[1], ME BD 240(3)[1], ME BD 241(3)[1], ME BD 245(1)[1], ME BD 320W(4), ME BD 340(3), ME BD 443(3), ME BD 445(3), ME BD 446(4) (Sem: 5-6)
ME BD 329(3)[1], ME BD 343(3)[1], ME BD 455(4)[1], ME BD 480(3)[1], ME BD 481(3)[1] (Sem: 7-8)

ADDITIONAL COURSES (8 credits)
CMPSC 201C GQ(3) or CMPSC 201F GQ(3) (Sem: 3-6)
ECON 002 GS(3) or ECON 004 GS(3) (Sem: 1-6)
PHYS 213(2) or PHYS 214(2) (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 9 credits of technical courses from school-approved list. (These credits must be selected to fulfill the engineering science and design requirements of the major.) (Sem: 7-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

MECHANICAL ENGINEERING TECHNOLOGY

Capital College

The goal of the Mechanical Engineering Technology program is to provide our students with the necessary training and education so that they can provide high-level technical support to a variety of industrial, commercial, consulting, and governmental organizations. The emphasis of our program is in the application of scientific and engineering principles. Technical communication in oral and written form is also emphasized. Our graduates are expected to appreciate the ethical and societal responsibilities of a technologist, the concepts of Continuous Quality Improvement and the continuing impact of globalization of design, manufacturing and marketing of technical goods and services. Our graduates are trained to deal with choice of materials and methods that are safe, environmentally and aesthetically acceptable and economically competitive. Typical

responsibilities that may be assigned to our graduates are the development and evaluation of machines and mechanisms; development, organization and supervision of manufacturing processes and procedures; the instrumentation, control and testing of a process; quality control; technical marketing and sales; design of mechanical systems for heating and cooling and energy management.

The strengths of our program include: hands-on training; extensive laboratory experience; state of the art computer methods, excellent job placement and accreditation by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET).

Graduates who wish to continue their professional development can take the Fundamentals of Engineering exam in Pennsylvania, a prerequisite for taking the Professional Engineering exam.

For a B.S. degree in Mechanical Engineering Technology, a minimum of 128 credits is required.

ENTRY TO MAJOR REQUIREMENTS: Entry to the Mechanical Engineering Technology major requires a 2.00 or higher cumulative grade-point average.

REENROLLMENT: Associate degree students should file a re-enrollment form during the final semester of their associate degree. Students reenrolling from an associate's degree into the bachelor's degree should run a degree audit from eLion, using the M E T major code, to determine their curriculum requirements.

GENERAL EDUCATION: 45 credits
(18 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 0-1 credits

REQUIREMENTS FOR THE MAJOR: 100-105 credits
(This includes 18 credits of General Education courses: 3 credits of GWS courses; 9 credits of GN courses; 6 credits of GQ courses.)

PRESCRIBED COURSES (51 credits)
CHEM 012 GN(3), CHEM 014 GN(1) (Sem: 1-4)
MATH 140 GQ(4) (Sem: 1-5)
STAT 200 GQ(4) (Sem: 2-6)
ENGL 202C GWS(3) (Sem: 3-4)
I E T 308(3), M E T 361(3) (Sem: 5-6)
E T 420W(3), I E T 302(2), M E T 312(3), M E T 315(3), M E T 321(2), M E T 331(2), M E T 405(2)[1], M E T 411(3), M E T 413(3)[1], M E T 434(3), M E T 442(4)[1] (Sem: 5-8)

ADDITIONAL COURSES (31-36 credits)
Select 2-3 credits from: EG T 101(1) and EG T 102(1) or ED&G 100(3) (Sem: 1-2)
Select 3-4 credits from: PHYS 150 GN(3) or PHYS 211 GN(4) (Sem: 1-2)
Select 3 credits from: E MCH 011(3) or MCH T 111(3) (Sem: 2-3)
Select 3-4 credits from: PHYS 151GN(3) or PHYS 212 GN(4) (Sem: 2-4)
Select 3 credits from: I E T 101(3) or I E T 311(3) (Sem: 2-5)
Select 3-4 credits from: I E T 215(2) and I E T 216(2) or I E T 321(3) (Sem: 2-5)
Select 3 credits from: E MCH 012(3), E T 321(3), or M E T 206(3) (Sem: 3-4)
Select 3 credits from: E T 322(3), E MCH 013(3), or MCH T 213(3) (Sem: 3-4)
Select 1 credit from: E T 323(1) or MCH T 214 (1) (Sem: 3-6)
Select 3-4 credits from: M E T 210W(3) or M E T 305(4) (Sem: 3-6)
Select 4 credits from: EE T 101(3), EE T 109(1) or E E T 320(4) (Sem: 3-7)

SUPPORTING COURSES AND RELATED AREAS (18-19 credits)
Select 9-10 credits from the department approved list. (Sem: 5-8)
Select 9 credits from 300-400 level I E T, M E T, M ENG or E MCH courses in consultation with an academic adviser and in support of the student's interests. (Sem: 5 - 8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

MECHANICAL ENGINEERING TECHNOLOGY

Penn State Erie, The Behrend College

This major may be taken either as a four-year baccalaureate program or in a "2+2" degree format. The latter allows graduates of associate degree programs in mechanical engineering technology or related areas to gain greater breadth and depth of knowledge in mechanical engineering technology. The baccalaureate program emphasizes applied design and analysis, complementing a hands-on manufacturing and materials focus. The graduate gains valuable knowledge of total manufacturing processes ranging from applied design to manufacture.

This major includes instruction in materials engineering, thermodynamics, heat transfer, hydraulics, finite-element analysis, and use of parametric solids modeling design packages, as well as supporting course work in mathematics and science. Oral and written communications are stressed, as is the ability to work within a team-oriented environment. The major culminates with a capstone design project involving an actual design or manufacturing problem sponsored by regional industry. This program is accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology, 111 Market Pl., Suite 1050, Baltimore, MD 21202.

Graduates have qualified for careers in a wide variety of industries that manufacture or use mechanical systems. Careers include positions in applied product design, manufacturing process development, field service support, supervision of manufacturing facilities, tool and die design, quality control, plant supervision and management, and technical sales.

For the B.S. degree in Mechanical Engineering Technology, a minimum of 131 credits is required. A student enrolled in this major must earn at least a grade of C in each 300- and 400-level course.

GENERAL EDUCATION: 45 credits
(18 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in GENERAL EDUCATION course selection)

ELECTIVES: 0-1 credit

REQUIREMENTS FOR THE MAJOR: 103-104 credits
(This includes 18 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GWS courses.)

PRESCRIBED COURSES (75 credits)
ENGL 202C GWS(3), IE T 101(3)[1], MCH T 111(3)[1], PHYS 150 GN(3), PHYS 151 GN(3) (Sem: 1-4)
MCH T 213(3), MCH T 214(1), IE T 215(2), IE T 216(2), ME T 206(3)[1], ME T 210W(3)[1] (Sem: 3-4)
CHEM 012 GN(3), CHEM 014 GN(1), IETBD 333(2), MTHBD 210(4), MTHBD 211(4), METBD 306(3), METBD 320(3), METBD 330(3), METBD 331(4), METBD 341(3), METBD 350(3) (Sem: 5-6)
METBD 430(3), METBD 450(3), METBD 470(3), METBD 480(1), METBD 490(3) (Sem: 7-8)

ADDITIONAL COURSES (22-23 credits)
EETBD 100(3); or EE T 101(3) and EE T 109(1) (Sem: 1-4)
MATH 081 GQ(3)[1], MATH 082 GQ(3)[1], MATH 083 GQ(4)[1]; or MTHBD 091 GQ(5)[1], MTHBD 092 GQ(5)[1] (Sem: 1-4)
METBD 050(3); or CMPSC 101 GQ(3) (Sem: 1-4)
METBD 110(3), METBD 111(3); or EG T 101(1), EG T 102(1), EG T 114(2), EG T 201(2) (Sem: 1-4)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits of technical electives from School-approved list (Sem: 7-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

MEDIA STUDIES

College of Communications

This major is designed for students who want to pursue an academic rather than professional program of media studies. Students are exposed first to the breadth of approaches to understanding the mass media (e.g., aesthetic, humanistic, social-behavioral, legal policy) and then, by selecting one of several options, go into depth in a specialized area of media studies. All options within the major are closely intertwined with the liberal arts and sciences. Therefore, students who successfully complete this major must have a strong foundation in the liberal arts and well-developed language and analytical skills. That foundation should include courses such as ART H 100 GA(3), ECON 002 GS(3), HIST 002 GH(3), PSY 002 GS(3), and SOC 001 GS(3). Students must select at least 90 credits in non-COMM courses, including at least 65 credits in the liberal arts and sciences.

The following three options are offered:

FILM AND TELEVISION STUDIES OPTION: This option is designed for students interested in studying the art, history, and criticism of film and television. Electives offer students the opportunity to pursue a related field, such as art, art history, creative writing, speech communication, or theatre arts. This option merges aesthetics and social sciences and is appropriate for those seeking a more theoretical/critical approach to the study of film and video.

GENERAL OPTION: In this option, a student and faculty adviser work together to tailor a program of courses to meet the student's individual interest in a coherent theme in media studies. Examples of themes include, but are not limited to, communication law and policy, communication and the environment, communication and health campaigns, media effects and society, minorities and the media, and gender and the

media. The General option consists of three sets of courses totaling 18 credits, including: (1) a set of predefined College of Communications courses in communications theory from which students must take two courses for 6 credits; (2) a set of predefined courses in research methods relating to any of the traditions of communications research (communication science, cultural studies, critical studies, etc.) from which students must take two courses for 6 credits; and (3) a student-and-adviser selected cluster of any two courses worth a combined 6 credits—courses either from inside or outside the College of Communications—that the student and faculty adviser determine, after consultation and agreement between the two, best serve the student's area of interest.

INTERNATIONAL COMMUNICATIONS OPTION: This option is designed for students who want to study the mass media systems of the world and their role in international affairs. The option offers students an opportunity to enhance their occupational opportunities in international business, organizations, or government and to be better prepared to participate in the world community.

Students must select at least 80 credits in courses outside the College of Communications, including at least 65 in the liberal arts and sciences.

For the B.A. degree in Media Studies, a minimum of 120 credits is required.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 0-18 credits

COLLEGE OF COMMUNICATIONS BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 33-54 credits[1]

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 15 credits

PRESCRIBED COURSES (9 credits)
COMM 404(3), COMM 405(3), COMM 413(3) (Sem: 5-8)

ADDITIONAL COURSES (6 credits)
Select 3 credits from COMM 100 GS(3), COMM 150 GA(3), or COMM 180(3) (Sem: 3-4)
Select 3 credits from COMM 408(3) or COMM 411(3) (Sem: 5-8)

REQUIREMENTS FOR THE OPTION: 18 credits

FILM AND TELEVISION STUDIES OPTION: 18 credits

PRESCRIBED COURSES (6 credits)
COMM 242(3), COMM 250 GA(3) (Sem: 3-4)

ADDITIONAL COURSES (12 credits)
Select 12 credits from COMM 451(3), COMM 452(3), COMM 453(3), COMM 454(3), COMM 455(3), COMM 495(1-3), or COMM 496(1-18) (Sem: 5-8)

GENERAL OPTION: 18 credits

ADDITIONAL COURSES (12 credits)
Select 6 credits in communication theory from COMM 205 GI(3), COMM 250 GA(3), COMM 261 GH(3), COMM 381(3), COMM 401(3), COMM 403(3), COMM 407(3), COMM 408(3), COMM 409(3), COMM 410(3), COMM 411(3), COMM 417(3), COMM 419(3), COMM 455(3), COMM 480(3), COMM 492(3) [Only courses not used to fulfill common requirements for the major may be selected, and at least 3 credits must be at the 400 level] (Sem: 5-8)
Select 6 credits in research methods from ANTH 428(3), ANTH 458(3), CAS 204(3), CAS 411(3), CAS 415(3), CAS 450W(3), ECON 490(3), EDPSY 406(3), EDPSY 450(3), ENGL 200(3), PL SC 408(3), PL SC 409(3), PL SC 420(3), PSY 415(3), PSY 450(3), MS&IS 402(3), MS&IS 404(3), SOC 007(3), SOC 207(3), SOC 470(4), SOC 471(3), STAT 401(3), STAT 460(3), STAT 462(3), STAT 464(3), WMNST 401(3) [At least 3 credits must be at the 400 level] (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits in consultation with a faculty adviser focusing on a coherent theme in any of the areas of media

theory, research and policy. These credits are not based on a predefined cluster of courses and therefore allow for substantial flexibility in catering to students' specific interests. Courses from outside the college may be chosen. [At least 3 credits must be at the 400 level. Prior department approval is required.] (Sem: 5-8)

INTERNATIONAL COMMUNICATIONS OPTION: 36 credits

PRESCRIBED COURSES (6 credits)
COMM 410(3), COMM 419(3) (Sem: 5-8)

ADDITIONAL COURSES (12 credits)
Select 12 credits of COMM 499 DF(1-12) (Manchester Mass Communications Program), other Education Abroad Programs, other COMM courses, or other international-related courses with prior department approval (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (18 credits)
Students must take a University-approved minor in a foreign language or area studies. The minimum requirement for a minor is 18 credits. By careful planning, students may use General Education and Bachelor of Arts courses to help fulfill this requirement. In lieu of a minor, a student may take a concurrent major or concurrent degree in a foreign language or area of study. Students should consult with their advisers as soon as possible about this requirement. (Sem: 1-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

MEDIEVAL STUDIES

College of the Liberal Arts
This is an interdisciplinary program of study designed to give students an integrated knowledge of medieval civilization. While the main area of study is the fifth to sixteenth centuries in Europe, a global perspective is offered with particular attention to the Near East and the Pacific Rim.

For the B.A. degree in Medieval Studies, a minimum of 123 credits is required.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 24 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 30 credits[1]

PRESCRIBED COURSES (6 credits)
MEDVL 107 GH(3) or HIST 107 GH(3), MEDVL 108 GH(3) (Sem: 3-4)

ADDITIONAL COURSES (24 credits)
(A minimum of 12 credits must be in 400-level courses.)
Select 24 credits from the program list of courses dealing with the Middle Ages from no less than three of the following areas:

Art
ART H 201 GA(3) (Sem: 1-8)
ART H 312 GA(3) (Sem: 3-8)
ART H 402(3), ART H 412(3), ART H 422(3-9), ART H 442(3), ART H 452(3) (Sem: 5-8)

History
HIST 105 GH(3), HIST 108 GH(3), HIST 141 GH(3), HIST 165(3) (Sem: 1-8)
HIST 407(3), HIST 408(3), HIST 411(3), HIST 412(3), HIST 413(3), HIST 471W(3), HIST 480(3) (Sem: 5-8)

Literature and Language
CMLIT 001 GH(3), CMLIT 106 GH;GI(3), ENGL 221W(3), GER 175 GH;DF(3), HEBR 010 GH;GI(3), SPAN 130 GH;DF(3) (Sem: 1-8)

FR 351(3), IT 350(3), SPAN 353(3) (Sem: 3-8)
CMLIT 401W(3), CMLIT 408(3), ENGL 441(3), ENGL 442(3), FR 422(3), GER 430(3), GER 431(3), IT 415(3), IT 490(3), LATIN 420(3-6), SPAN 418(3) (Sem: 5-8)

Medieval Studies
MEDVL 187(3) (Sem: 1-2)
MEDVL 197(1-9), MEDVL 199 DF(1-12), MEDVL 294(1-12), MEDVL 299 DF(1-12) (Sem: 1-8)
MEDVL 395(1-18), MEDVL 399 DF(1-12) (Sem: 3-8)
MEDVL 411(3), MEDVL 413(3), MEDVL 494(1-12), MEDVL 496(1-18), MEDVL 497(1-9), MEDVL 499 DF(1-12) (Sem: 5-8)

Philosophy and Religious Studies
RL ST 120 GH(3), PHIL 207 GH(3) (Sem: 1-8)
PHIL 454(3-6), RL ST 420(3) (upon advising) (Sem: 5-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

METEOROLOGY

College of Earth and Mineral Sciences

Meteorology is a rigorous scientific discipline devoted to the attainment of an increased understanding of the atmosphere and the development of methods for applying that knowledge to practical problems. Although this field is usually associated with weather prediction, it also has significance in environmental, energy, agricultural, oceanic, and hydrological sciences. For students wishing to pursue many of these areas, the department offers several options within the major.

The major requires a solid foundation in mathematics and the physical sciences, and it provides a comprehensive survey of the fundamentals of atmospheric science. It has sufficient flexibility to permit intensive advanced study in such related areas as mathematics, earth sciences, or engineering. The department has particular strengths in weather analysis and prediction, including forecast uncertainty and severe weather; physical meteorology, including radar meteorology, instrumentation and atmospheric measurements; and applied areas, including atmospheric diffusion, air pollution chemistry, dynamic meteorology, tropical meteorology, climate, and remote sensing.

Graduating meteorologists are prepared for professional employment with industry, private consulting firms, government, and the armed forces or for further study toward graduate degrees normally required for research, university, or management positions.

The freshman and sophomore years are largely devoted to preparatory work in science, mathematics, and the liberal arts. The junior and senior years involve a core of basic courses in applied and theoretical topics and a choice of courses offering specialized training. The courses unique to each option are normally taken in the junior and senior years.

For a Meteorology course to serve as a prerequisite for any subsequent prescribed or supporting Meteorology course in the major, a grade of C or better must be earned in the prerequisite course.

For the B.S. degree in Meteorology, a minimum of 121 credits is required.

AIR-QUALITY STUDIES OPTION: This option enables students to gain in-depth knowledge of important areas within the air-quality field. Air-quality meteorologists are employed in both the public and private sectors. Public-sector positions include those with local, state, and federal agencies charged with regulatory, enforcement, and research activities. Within the private sector, air quality meteorologists are employed by consulting firms whose clients are concerned with meeting environmental regulations on emissions of pollutants into the atmosphere or with determining the effects of such emissions. Topics offered in the option include the physical and chemical nature of air pollutants; their sources in industrial processes and human activity; their control at the source; their transport and dispersion through the atmosphere; their interaction with other atmospheric constituents; their removal through cloud processes, fallout, and wet deposition; their effects on ecosystems, materials, and humans; and their economic and societal impacts.

ATMOSPHERIC SCIENCES OPTION: This option challenges students to strengthen and broaden their understanding of the physics and chemistry of the atmosphere and oceans. It helps prepare them for employment in the diverse field of the atmospheric sciences and for graduate study in the atmospheric or related disciplines. Students are encouraged to participate in undergraduate research projects under the supervision of atmospheric and oceanic scientists in the department.

CLIMATOLOGY OPTION: This option allows students to learn about the earth's climate from regional to global scales, with emphasis on assessing human impacts on the climate system. Students who pursue this area of study learn how the tropical, mid-latitude and polar regions of the atmosphere interact, as well as learn how the atmosphere interacts with the oceans, land masses and biosphere. Study of the climate changes throughout earth's history provides a perspective on potential climate changes due to human activity. Analysis of the societal aspects of climate change offers a mechanism to evaluate the importance of the magnitudes and uncertainties of the expected physical changes.

ENVIRONMENTAL METEOROLOGY OPTION: Environmental Meteorology prepares the student for understanding the impact of the weather on the environment, which is to say the impacts of air and water on ecosystems at human scales. In order to do this, the option establishes links between atmospheric physics and a variety of environmental disciplines pertaining to land, water, soils, and plants. Depending on his/her interests, the student will select courses in the biological sciences, air or water quality, human dynamics, data analysis and surface microclimate. An important component of this program is an undergraduate research project, in which the student is encouraged to develop a topic that addresses problems related to the environment and society, if possible by interacting with public agencies or groups.

GENERAL OPTION: This option has sufficient flexibility to serve the needs of students who wish to pursue topics chosen broadly from subdisciplines of meteorology or from related areas. The General option is appropriate both for students who intend to pursue postgraduate degrees and for students who want to emphasize a topic for which no option exists.

WEATHER FORECASTING AND COMMUNICATIONS OPTION: This option prepares students for careers in which their skills are weather forecasters are effectively used in a variety of ways, from science reporting and television broadcasting to web design and computer-based weather graphics production.

GENERAL EDUCATION: 45 credits
(24 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 1-8 credits

REQUIREMENTS FOR THE MAJOR: 92-99 credits
(This includes 24 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 9 credits of GWS courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 74 credits

PRESCRIBED COURSES (55 credits)
CHEM 012 GN(3), EM SC 100S GWS(3)[71], MATH 140 GQ(4), MATH 141 GQ(4)[1], PHYS 211 GN(4) (Sem: 1-2)
MATH 251(4), PHYS 212 GN(4) (Sem: 3-4)
METEO 300(3), METEO 411(4)[1], METEO 421(4)[1], METEO 422(4)[1], METEO 431(3)[1], METEO 436(3)[1], METEO 437(3)[1], METEO 445(1)[1], METEO 446(1)[1], METEO 473(3)[1] (Sem: 5-6)

ADDITIONAL COURSES (19 credits)
ENGL 015 GWS(3) or ENGL 030 GWS(3) (Sem: 1-2)
CMPSC 101 GQ(3), CMPSC 201C GQ(3) or CMPSC 201F GQ(3) (Sem: 3-4)
MATH 230 (4)[1] or MATH 231(2) [1] and MATH 232(2) [1] (Sem: 3-4)
ENNEC 472 or STAT 301 GQ(3) or STAT 401(3) (Sem: 3-6)
CAS 100 GWS(3) or ENGL 202C GWS(3) (Sem: 3-8)
METEO 101 GN(3) or METEO 200A(1.5) and METEO 200B(1.5) or METEO 201(3) (Sem: 1-5)

REQUIREMENTS FOR THE OPTION: 18-25 credits

AIR-QUALITY STUDIES OPTION (18-21 credits)

PRESCRIBED COURSES (12 credits)
CHEM 013 GN(3) (Sem: 1-6)
M E 470(3), METEO 454(3), METEO 455(3) (Sem: 6-8)

ADDITIONAL COURSES (6 credits)
Select 6 credits from ENNEC 484W(3), E R M 430(3), F SC 401(3), F SC 422(3), F SC 430(3), GEOG 357(3), GEOG 406(3), M E 405(3), STAT 462(3) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (0-3 credits)
Select 0-3 credits from any writing-intensive (W) course offered by the College of Earth and Mineral Sciences (Sem: 7-8)

ATMOSPHERIC SCIENCES OPTION: 18-19 credits

ADDITIONAL COURSES (12-13 credits)
Select 12-13 credits from METEO 414(4), METEO 433(3), METEO 434(3), METEO 448(3), METEO 451(3), METEO 452(3), METEO 454(3), METEO 455(3), METEO 465(3), METEO 466(3), METEO 470(3), METEO 471W(3), METEO 472W(3), METEO 475W(3), METEO 480W(3) (Up to 9 of these credits in relevant courses in Acoustics, Chemistry, Engineering, Mathematics, and Physics may be substituted with the approval of the student's adviser.) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits of W courses or their equivalent. Three of these six W credits must be selected from any writing-intensive course offered by the College of Earth and Mineral Sciences. (Sem: 7-8)

CLIMATOLOGY OPTION (18 credits)

PRESCRIBED COURSES (15 credits)
GEOG 406(3) or GEOG 408W(3); GEOSC 320(3); METEO 451(3), METEO 470(3), METEO 475W(3)/GEOSC 475W(3) (Sem: 6-8)

ADDITIONAL COURSES (3 credits)
Select 3 credits from GEOG 406(3)*, GEOG 408W(3)*, GEOG 432W(3), GEOG 433W(3), GEOG 437(3), METEO 452(3), METEO 466(3), METEO 472W(3) (Sem: 6-8)
*If not taken as a Prescribed Course

ENVIRONMENTAL METEOROLOGY OPTION: 22 credits

PRESCRIBED COURSES (16 credits)
BIOL 110 GN(4), C E 370(3), GEOG 121 GS(3), METEO 454(3), METEO 480W(3) (Sem: 2-8)

ADDITIONAL COURSES (6 credits)
Select 6 credits from A B E 400(3), C E 475(3), ENNEC 100 GS(3), E R M 430(3), F SC 430(3), GEOG 330(3), GEOG 352(3), GEOG 357(3), GEOG 453(3), M E 033(3), M E 405(3), M E 470(3), METEO 448(3), METEO 455(3), STAT 462(3), W F S 209 GN(3) (Sem: 2-8)

GENERAL OPTION: 19 credits

SUPPORTING COURSES AND RELATED AREAS (19 credits)
Select 3 credits from any writing-intensive (W) course offered by the College of Earth and Mineral Sciences (Sem: 7-8)
Select 16 credits from 400-level METEO courses and/or 200-, 300-, or 400-level courses from the Colleges of Agricultural Sciences, Earth and Mineral Sciences, Engineering, and/or Science (Sem: 7-8)

WEATHER FORECASTING AND COMMUNICATIONS OPTION (22-25 credits)

PRESCRIBED COURSES (13 credits)
METEO 481(3), METEO 482(3) (Sem: 5-6)
METEO 414(4), METEO 415(3) (Sem: 6-8)

ADDITIONAL COURSES (9 credits)
Select 9 credits from CAS 211(3) (Sem: 5-8), ENGL 416(3), GEOSC 402W GI(3), METEO 412(4), METEO 413(3), METEO 416(3), METEO 418W(3), METEO 483(3) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (0-3 credits)
Select 0-3 credits from any writing-intensive (W) course offered by the College of Earth and Mineral Sciences (Sem: 7-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
[71] The following substitutions are allowed for students attending campuses where the indicated courses is not offered: CAS 100 GWS or ENGL 202C GWS can be substituted for EM SC 100S GWS.

MICROBIOLOGY

Eberly College of Science

Microbiology is the science of the "simple" forms of life and of the response of more complex life forms to their presence and activities. Students in the Microbiology major will (1) complete a comprehensive study of life processes at the molecular and cellular level, with particular emphasis on prokaryotes, and (2) perform basic and advanced techniques in laboratory methodology. Through advanced course study, the many subdisciplines of microbiology such as molecular genetics, immunology, and virology may be explored more fully. Ample

opportunities exist for participation in faculty-initiated research projects. Extensive laboratory experience is a particular strength of the major. Courses in such applied areas as industrial, medical, and food microbiology help prepare students for careers in the pharmaceutical, biotechnical, and agricultural industries.

In order to be eligible for entrance to the Microbiology major, a student must have: (1) attained at least a 2.00 cumulative grade-point average and (2) completed CHEM 012 GN(3), CHEM 013 GN(3), CHEM 014 GN(1), and MATH 140 GQ(4) and earned a grade of C or better in each of these courses.

For the B.S. degree in Microbiology, a minimum of 125 credits is required.

GENERAL EDUCATION: 45 credits
(15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 95 credits[86]
(This includes 15 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses.)

PRESCRIBED COURSES (64 credits)
CHEM 012 GN(3)[1], CHEM 013 GN(3)[1], CHEM 014 GN(1)[1], CHEM 015 GN(1), MATH 140 GQ(4)[1], MATH 141 GQ(4), PSU 016(1) (Sem: 1-2)
PHYS 250 GN(4), PHYS 251 GN(4) (Sem: 1-4)
BIOL 222(3), CHEM 036(2), CHEM 038(3), CHEM 039(3), MICRB 201(3)[85], MICRB 202(2), MICRB 251(3)[85], MICRB 252(3)[85], MICRB 342(3) (Sem: 3-4)
B M B 400(3), B M B 401(2), B M B 402(3), MICRB 421W(3) (Sem: 5-6)
B M B 428(3) (Sem: 5-8)

ADDITIONAL COURSES (21-23 credits)
Select any four of the following: MICRB 401(3), MICRB 410(3), MICRB 412(3), MICRB 415(3), or MICRB 450(2) (Sem: 5-6)
Select 3 credits from B M B 444(1), B M B 445W(2), B M B 446(1), MICRB 422(2), MICRB 447(1) (Sem: 5-8)
Select 6-7 credits from FD SC 408(2) or any other MICRB 400-level course except MICRB 400(2) and MICRB 496(1-18) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (9-11 credits)
Select 9-11 credits from department list (Sem: 5-8)

Note: A student enrolled in an ROTC program may, after consultation with the head of the Microbiology program, substitute up to 6 credits of ROTC in the categories of Additional Courses and Supporting Courses and Related Areas.
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
[85] To graduate, a grade of C or better is required in two of the following courses: MICRB 201, B M B/MICRB 251, B M B/MICRB 252.
[86] To graduate, a grade of C or better is required in 9 credits of any B M B, or MICRB 400-level course except B M B 443W, B M B 444, B M B 445W, B M B 446, B M B 495, B M B 496, MICRB 421W, MICRB 422, MICRB 447, MICRB 495, MICRB 496.

MINERAL ECONOMICS

College of Earth and Mineral Sciences

This program combines training in economics, physical sciences, management sciences, and quantitative methods, with a core of courses centering on the energy, environmental, mineral and material industries. The field helps prepare students for careers in industry, government, financial institutions, consulting firms, or international organizations. The curriculum also provides a strong base for further graduate study in business, economics, law, social sciences, and environmental sciences.

The Energy, Environmental, and Mineral Economics curriculum allows the student to pursue a special interest appropriate to his or her career objectives. The core courses program covers minerals in the environment, energy and environmental policy, materials markets, risk management, finance, and applications of statistical techniques to two options: (1) Nonrenewable Resource and Environmental Economics and (2) Minerals and Energy Business.

For the B.S. degree in Energy, Environmental, and Mineral Economics, a minimum of 120 credits is required.

GENERAL EDUCATION: 45 credits
(21-27 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 29-36 credits

REQUIREMENTS FOR THE MAJOR: 66-67 credits
(This includes 21-27 credits of General Education courses: 3-9 credits of GN courses; 6 credits of GQ courses; 6 credits of GS courses; and 6 credits of GWS courses.)

COMMON REQUIREMENTS FOR THE MAJOR: 48 credits

PRESCRIBED COURSES (35 credits)
ECON 002 GS(3)[1], ECON 004 GS(3), EM SC 100S GWS(3)[71], MATH 111 GQ(2) (Sem: 1-4)
ENNEC 100 GS(3)[1], MATSE 081 GN(3) (Sem: 3-6)
CMPSC 101 GQ(3)[23], ECON 302 GS(3) (Sem: 3-6)
ENNEC 484W(3)[1], ENNEC 490(3)[1] (Sem: 5-6)
ENNEC 491(3)[1], ENNEC 492(3) (Sem: 7-8)

ADDITIONAL COURSES (13 credits)
ENGL 015 GWS(3) or ENGL 030 GWS(3) (Sem: 1-2)
GEOSC 001(3)[23] or GEOSC 020(GN)(3) (Sem: 1-4)
MATH 110 GQ(4) or MATH 140 GQ(4) (Sem: 1-4)
STAT 220(3) or ENNEC 472(3) (Sem: 3-6)

REQUIREMENTS FOR THE OPTION: 18-19 credits

NONRENEWABLE RESOURCE AND ENVIRONMENTAL ECONOMICS OPTION: 18 credits

PRESCRIBED COURSES (6 credits)
ENNEC 420(3) (Sem: 5-6)
ENNEC 401(3) (Sem: 7-8)

ADDITIONAL COURSES (12 credits)
EARTH 001(3) or EARTH 002 GN(3) (Sem: 3-6)
ECON 428(3) or AG EC 429(3) (Sem: 5-6)
ENNEC 482(3) or ENNEC 483(3) (Sem: 5-6)
F SC 301(3) or EGEE 101 GN(3) (Sem: 5-8)

MINERAL AND ENERGY BUSINESS OPTION: 19 credits

PRESCRIBED COURSES (16 credits)
ACCTG 211(4), B LAW 243(3), EM SC 304(3) (Sem: 3-6)
B LOG 301(3), EM SC 401(3) (Sem: 7-8)

ADDITIONAL COURSES (3 credits)
ECON 402(3) or ECON 443(3) (Sem: 7-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
[23] Students at a location other than University Park where CMPSC 101 GQ(3) is not available may substitute: CSE 103 GQ(4), CMPSC 201C GQ(3), or 201F GQ(3) for CMPSC 101 GQ(3).
[71] The following substitutions are allowed for students attending campuses where the indicated course is not offered: CAS 100 GWS or ENGL 202C GWS can be substituted for EM SC 100S GWS.

MINING ENGINEERING

College of Earth and Mineral Sciences

The Mining Engineering program program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET).

The undergraduate curriculum in mining engineering has been designed to enable students to apply the fundamentals necessary to achieve lifelong professional growth. Upon completion of the program, graduates will be able to pursue employment opportunities in both the private and public sectors as mining engineers, or will be able to pursue advanced education.

The courses are sequenced so that an appropriate blend of theory, applications, and project design is achieved. This enables the mining engineering student to appreciate and comprehend that a successful engineering design project requires a sound theoretical foundation, supported by experimentation and good engineering judgment. The program is designed such that the fundamentals of mathematics, earth, and engineering sciences are integrated into traditional mining engineering topics. Design projects, culminating in the capstone design project, are required throughout the curriculum. The proper execution of these projects

requires an awareness of acceptable problem-formulation strategies, the testing of alternative design methodologies, feasibility studies, environmental impacts, and overall economic considerations.

Graduates of the program will be prepared to perform in the various steps of mineral extraction, including exploration, evaluation, development, recovery, and processing. The mining engineering faculty is committed to an interactive teaching and learning environment to ensure that the student plays an active role in the learning process. The general education opportunities are sufficiently broad and diverse in nature and scope to enable the student to tailor the educational experience to particular interests, backgrounds, and expected roles in society.

The integration of knowledge and skills acquired during the course of study enables the student and, ultimately, the graduates of this program to do the following:

—To deliver curriculum material that is of sufficient science and engineering rigor to ensure that students have the basis for entering the private or public sectors as mining engineers, or higher education, if they so choose.

—To enable students to comprehend the interrelationships among geology, exploration, valuation, development, exploitation, and processing of mineral deposits in a coordinated manner, from the introductory mining course to the capstone mine-design course.

—To encourage student use of computer and information technology, in a comprehensive manner, as it relates to engineering applications for mineral resources.

—To stimulate student awareness, appreciation, and communication capabilities to address societal concerns with regard to the total environment, health and safety, sustainable development, and the conservation of our natural resources.

—To promote the concepts of teamwork, lifelong learning, and effective and ethical leadership.

STUDENT-TRAINEE PROGRAM: A five-year work-study plan is available to incoming students in Mining Engineering. Alternating periods of employment in industry and schooling at Penn State, the student-trainee obtains the BS degree in five years instead of four, following a rearranged major. Numerous mining and manufacturing companies as well as governmental agencies are cooperating with the University in providing employment during work periods. In addition to earning sufficient funds to finance their education, student-trainees acquire two years of valuable, practical, and professional experience. Additional information can be obtained from the department.

For the B.S. degree in Mining Engineering, a minimum of 130 credits is required.

GENERAL EDUCATION: 45 credits
(27 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 112 credits
(This includes 27 credits of General Education courses: 3 credits of GH courses; 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses; 6 credits of GWS courses.)

PRESCRIBED COURSES (92 credits)
CHEM 012 GN(3), CHEM 014 GN(1), EM SC 100S GWS(3)[71] (Sem: 1-2)
ECON 002 GS(3), ED&G 100(3) (Sem: 1-4)
MATH 140 GQ(4), MATH 141 GQ(4), MATH 250(3), STAT 301 GQ(3) (Sem: 1-6)
E MCH 210(5), GEOSC 071(3)[1], PHYS 211 GN(4), PHYS 212 GN(4), PHYS 213 GN(2) (Sem: 3-4)
MNG 030(2)[1], MNG 402(3), MNG 422(3), MNG 431(3) (Sem: 3-8)
C E 360(3), MN PR 301(3)[1], MN PR 413(1)[1], MNG 404(2), MNG 412(3) (Sem: 5-6)
GEOSC 201(4), MNG 023(2), MNG 410(2), MNG 411(2), MNG 441(3)[1], MNG 451W(5)[1] (Sem: 5-8)
A E 401(3), M E 030(3) (Sem: 7-8)

ADDITIONAL COURSES (14 credits)
Select 14 credits, one course from each category a, b, c, d, and e:
a. ENGL 015 GWS(3) or ENGL 030 GWS(3) (Sem: 1-2)
b. PHIL 103 GH(3) or PHIL 106 GH(3) or PHIL 107 GH(3) or PHIL 233 GH(3)/S T S 233 GH(3) (Sem: 1-4)
c. CMPSC 201C GQ(3) or CMPSC 201F GQ(3) (Sem: 3-4)
d. MATH 220 GQ(2) or MATH 231(2) (Sem: 3-4)
e. E MCH 012(3) or E MCH 112H(3) (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits in consultation with adviser (Students may apply 6 credits of ROTC.) (Sem: 5-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
[71] The following substitutions are allowed for students attending campuses where the indicated course is not offered: CAS 100 GWS or ENGL 202C GWS can be substituted for EM SC 100S GWS.

MUSIC, B.A.

College of Arts and Architecture

The Bachelor of Arts degree in Music combines a broad liberal education with a selection of courses in Music. The degree is designed to develop basic musicianship, the ability to perform, and a set of principles that leads to a fuller intellectual grasp of the art.

Students are required to pass a piano proficiency examination, enroll in a core ensemble for two semesters, and satisfactorily complete a senior project. Application for admittance into the program requires completion of a two-year core of music and General Education courses.

For the B.A. degree in Music, a minimum of 129 credits is required.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 10 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 50 credits[1]

PRESCRIBED COURSES (28 credits)
MUSIC 119S(2), MUSIC 121(1), MUSIC 122(1), MUSIC 131(2), MUSIC 132(2), MUSIC 161(1), MUSIC 162W(1) (Sem: 1-2)
MUSIC 221(1), MUSIC 222(1), MUSIC 231(2), MUSIC 261(3), MUSIC 262 (3), MUSIC 331(2) (Sem: 3-4)
MUSIC 332(2) (Sem: 5-6)
MUSIC 101(1), MUSIC 476W(3) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (22 credits)
Select 6 credits in applied music through Level IV of Primary; or MUSIC 110(1), MUSIC 170(1), MUSIC 210(1), MUSIC 270(1), and four semesters of KEYBD 100J GA(1) (Sem: 1-8)
Select 4 credits of ensembles (see School of Music Handbook for list of ensembles) (Sem: 1-8)
Select 12 credits of 400-level music courses (see School of Music Handbook for specifics) (Sem: 5-8)

Integrated B.A. in Music–M.A. in Music Theory

The School of Music offers a limited number of academically superior students enrolled in the Bachelor of Arts in Music the opportunity to enroll in an integrated program leading to both the B.A. in Music and the Master of Arts in Music Theory in a continuous program of study culminating in both degrees. The ability to coordinate as well as concurrently pursue the two degree programs enables the student to achieve greater depth and comprehensiveness than if the degrees are pursued sequentially and to earn the two degrees in five years. In particular, the program encourages the student to integrate the undergraduate thesis with the master's thesis thereby achieving a greater depth of inquiry.

APPLICATION PROCESS: To initiate the application process, students must submit a transcript, faculty recommendation, writing sample, and statement of goals. A faculty adviser will help undergraduate candidates determine a sequence of courses that will prepare them for acceptance into the IUG program. Normally a student would apply after the fourth semester and before the end of the sixth semester. For acceptance into the program students must successfully complete the following courses or their equivalent with a minimum average of 3.5 in their music courses, and a minimum GPA of 3.0: four semesters of music theory (MUSIC 131, MUSIC 132, MUSIC 231, MUSIC 331); four semesters of musicianship (MUSIC 121, MUSIC 122, MUSIC 221, MUSIC 222); three semesters of music history (MUSIC 162, MUSIC 261, MUSIC 262)

REDUCED COURSE LOAD: As many as 12 of the credits required for the master's degree may be applied to both undergraduate and graduate degree programs. A minimum of 50 percent of the courses proposed to count for both degrees must be at the 500 level. Thesis credits may not be double counted.

B.A. SENIOR PROJECT (Music 476W)/M.A. THESIS (Music 600): Students will be encouraged to select a B.A. Senior Project topic (Music 476W) that will later develop into the M.A. thesis. It is expected that the master's thesis consist of greater depth and specialization than the senior project.

ELIGIBILITY FOR A GRADUATE ASSISTANTSHIP: Students in the IUG program will be eligible for a graduate assistantship starting in the beginning of the fifth year.

TUITION CHARGES: Undergraduate tuition rates will apply as long as the student is an undergraduate, unless the student received financial support, for example, an assistantship requiring the payment of graduate tuition (from "Information and Guidelines for Establishing Integrated Undergraduate–Graduate Degree Programs"—approved by the Graduate Council, May 8, 1996).

Integrated B.A. in Music–M.A. in Music Theory and History

The School of Music offers a limited number of academically superior students enrolled in the Bachelor of Arts in Music the opportunity to enroll in an integrated program leading to both the B. A. in Music and the Master of Arts in Music Theory and History in a continuous program of study culminating in both degrees. The ability to coordinate as well as concurrently pursue the two degree programs enables the student to achieve greater depth and comprehensiveness than if the degrees are pursued sequentially and to earn the two degrees in five years. In particular, the program encourages the student to integrate the undergraduate thesis with the master's thesis thereby achieving a greater depth of inquiry.

APPLICATION PROCESS: To initiate the application process, students must submit a transcript, faculty recommendation, writing sample, and statement of goals. A faculty adviser will help undergraduate candidates determine a sequence of courses that will prepare them for acceptance into the IUG program. Normally a student would apply after the fourth semester and before the end of the sixth semester. For acceptance into the program students must successfully complete the following courses or their equivalent with a minimum average of 3.5 in their music courses, and a minimum GPA of 3.0: four semesters of music theory (MUSIC 131, MUSIC 132, MUSIC 231, MUSIC 331); four semesters of musicianship (MUSIC 121, MUSIC 122, MUSIC 221, MUSIC 222); three semesters of music history (MUSIC 162, MUSIC 261, MUSIC 262)

REDUCED COURSE LOAD: As many as twelve of the credits required for the master's degree may be applied to both undergraduate and graduate degree programs. A minimum of 50% of the courses proposed to count for both degrees must be at the 500 level. Thesis credits may not be double counted.

B.A. SENIOR PROJECT (Music 476W)/M.A. THESIS (Music 600): Students will be encouraged to select a B.A. Senior Project topic (Music 476W) that will later develop into the M.A. thesis. It is expected that the master's thesis consist of greater depth and specialization than the senior project.

ELIGIBILITY FOR A GRADUATE ASSISTANTSHIP: Students in the IUG program will be eligible for a graduate assistantship starting in the beginning of the fifth year.

Tuition Charges: Undergraduate tuition rates will apply as long as the student is an undergraduate, unless the student received financial support, for example, an assistantship requiring the payment of graduate tuition (from "Information and Guidelines for Establishing Integrated Undergraduate–Graduate Degree Programs"—approved by the Graduate Council, May 8, 1996).

Integrated B.A. in Music –M.A. in Musicology

The School of Music offers a limited number of academically superior students enrolled in the Bachelor of Arts in Music the opportunity to enroll in an integrated program leading to both the B.A. in Music and the Master of Arts in Musicology in a continuous program of study culminating in both degrees. The ability to coordinate as well as concurrently pursue the two degree programs enables the student to achieve greater depth and comprehensiveness than if the degrees are pursued sequentially and to earn the two degrees in five years. In particular, the program encourages the student to integrate the undergraduate thesis with the master's thesis thereby achieving a greater depth of inquiry.

APPLICATION PROCESS: To initiate the application process, students must submit a transcript, faculty recommendation, writing sample, and statement of goals. A faculty adviser will help undergraduate candidates determine a sequence of courses that will prepare them for acceptance into the IUG program. Normally a student would apply after the fourth semester and before the end of the sixth semester. For acceptance into the program students must successfully complete the following courses or their equivalent with a minimum average of 3.5 in their music courses, and a minimum GPA of 3.0: four semesters of music theory (MUSIC 131, MUSIC 132, MUSIC 231, MUSIC 331); four semesters of musicianship (MUSIC 121, MUSIC 122, MUSIC 221, MUSIC 222); three semesters of music history (MUSIC 162, MUSIC 261, MUSIC 262)

REDUCED COURSE LOAD: As many as twelve of the credits required for the master's degree may be applied to both undergraduate and graduate degree programs. A minimum of 50% of the courses proposed to count for both degrees must be at the 500 level. Thesis credits may not be double counted.

B.A. SENIOR PROJECT (Music 476W)/M.A. THESIS (Music 600): Students will be encouraged to select a B.A. Senior Project topic (Music 476W) that will later develop into the M.A. thesis. It is expected that the Master's Thesis consist of greater depth and specialization than the senior project.

TUITION CHARGES: Undergraduate tuition rates will apply as long as the student is an undergraduate, unless the student received financial support, for example, an assistantship requiring the payment of graduate tuition (from "Information and Guidelines for Establishing Integrated Undergraduate–Graduate Degree Programs"—approved by the Graduate Council, May 8, 1996).

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

MUSIC, B.MUS.

College of Arts and Architecture

The Bachelor of Music degree program is intended to prepare students for careers in composition or performance. Completion of this program requires that the student achieve a high level of competence in order to begin professional work or pursue further studies at the graduate level.

Entrance into this program will be determined by departmental evaluation.

For the B.Mus. degree in Music with an option in Composition, a minimum of 135 credits is required; with an option in Performance, 133-141 credits are required. All students are required to pass a piano proficiency examination.

NOTE: Options were added too late for print deadline. See www.psu.edu/bulletins/bluebook.
GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 88-96 credits

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 34 credits[1]

PRESCRIBED COURSES (24 credits)
MUSIC 121(1), MUSIC 122(1), MUSIC 131(2), MUSIC 132(2), MUSIC 161(1), MUSIC 162W(1) (Sem: 1-2)
MUSIC 221(1), MUSIC 222(1), MUSIC 231(2), MUSIC 261(3), MUSIC 262(3), MUSIC 266(1) (Sem: 3-4)
MUSIC 331(2), MUSIC 332(2) (Sem: 5-6)
MUSIC 101(1) (Sem: 7-8)

ADDITIONAL COURSES (10 credits)
Select 4 credits of approved ensembles (see School of Music Handbook for list of ensembles) (Sem: 1-8)
Select 6 credits from MUSIC 461W(3), MUSIC 462W(3), MUSIC 463W(3), or MUSIC 464W(3) (Sem: 5-8)

REQUIREMENTS FOR THE OPTION: 54-62 credits

COMPOSITION OPTION: 56 credits

PRESCRIBED COURSES (42 credits)[1]
MUSIC 173S(2), MUSIC 174(2) (Sem: 1-2)
KEYBD 100J GA(6) (Sem: 1-8)
MUSIC 256(1), MUSIC 273(2), MUSIC 274(2) (Sem: 3-4)
MUSIC 336(2), MUSIC 366(2), MUSIC 373(3), MUSIC 374(3), MUSIC 458(3), MUSIC 465(2), MUSIC 471(2) (Sem: 5-6)
MUSIC 431(2), MUSIC 433(2), MUSIC 473(3), MUSIC 474(3) (Sem: 7-8)

ADDITIONAL COURSES (7 credits)[1]
Select 2 credits of approved ensembles (see School of Music Handbook for list of ensembles) (Sem: 1-8)
Select 5 credits of MUSIC courses (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (7 credits)
Select 7 credits in consultation with adviser (Students may apply 6 credits of ROTC.) (Sem: 3-8)

PERFORMANCE OPTION: 54-62 credits

PRESCRIBED COURSES (3 credits)
MUSIC 129S(3) (Sem: 1-2)

ADDITIONAL COURSES (6 credits)[1]
Select 4 credits of approved ensembles (see School of Music Handbook for list of ensembles) (Sem: 1-8)
Select 2 credits from MUSIC 181(2) or MUSIC 182(2), MUSIC 267(2), MUSIC 336(2), MUSIC 422(3), MUSIC 431(2), MUSIC 432(2), MUSIC 433(2-3), MUSIC 438(2), MUSIC 471(2), or MUSIC 472(2) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (45-53 credits)
Select 21 credits in applied music through Level VIII of performance[1] (Sem: 1-8)
Select 8-16 credits in foreign language: French, German, or Italian[4]; (Sem: 1-8)
Select 4 credits in a secondary instrument[1] (Sem: 1-8)
Select 9 credits in music in consultation with adviser[1] (Students may apply 6 credits of ROTC.) (Sem: 1-8)
Select 3 credits in consultation with adviser (Sem: 1-8)

Integrated B.M. in Performance—M.A. in Music Theory

The School of Music offers a limited number of academically superior students enrolled in the Bachelor of Music the opportunity to enroll in an integrated program leading to both the B.M. in Performance and the Master of Arts in Theory in a continuous program of study culminating in both degrees. The ability to coordinate as well as concurrently pursue the two degree programs enables the student to achieve greater depth and comprehensiveness than if the degrees are pursued sequentially and to earn the two degrees in five years.

APPLICATION PROCESS: To initiate the application process, students must submit a transcript, faculty recommendation, writing sample, and statement of goals. A faculty adviser will help undergraduate candidates

determine a sequence of courses that will prepare them for acceptance into the IUG program. Normally a student would apply after the fourth semester and before the end of the sixth semester. For acceptance into the program students must successfully complete the following courses or their equivalent with a minimum average of 3.5 in their music courses, and a minimum GPA of 3.0: four semesters of music theory (MUSIC 131, MUSIC 132, MUSIC 231, MUSIC 331); four semesters of musicianship (MUSIC 121, MUSIC 122, MUSIC 221, MUSIC 222); three semesters of music history (MUSIC 162, MUSIC 261, MUSIC 262)

REDUCED COURSE LOAD: As many as twelve of the credits required for the master's degree may be applied to both undergraduate and graduate degree programs. A minimum of 50% of the courses proposed to count for both degrees must be at the 500 level. Thesis credits may not be double counted.

ELIGIBILITY FOR A GRADUATE ASSISTANTSHIP: Students in the IUG program will be eligible for a graduate assistantship starting in the beginning of the fifth year.

TUITION CHARGES: Undergraduate tuition rates will apply as long as the student is an undergraduate, unless the student received financial support, for example, an assistantship requiring the payment of graduate tuition (from "Information and Guidelines for Establishing Integrated Undergraduate–Graduate Degree Programs"—approved by the Graduate Council, May 8, 1996).

Integrated B.M. in Performance—M.A. in Music Theory and History

The School of Music offers a limited number of academically superior students enrolled in the Bachelor of Music the opportunity to enroll in an integrated program leading to both the B.M. in Performance and the Master of Arts in Music Theory and History in a continuous program of study culminating in both degrees. The ability to coordinate as well as concurrently pursue the two degree programs enables the student to achieve greater depth and comprehensiveness than if the degrees are pursued sequentially and to earn the two degrees in five years.

APPLICATION PROCESS: To initiate the application process, students must submit a transcript, faculty recommendation, writing sample, and statement of goals. A faculty adviser will help undergraduate candidates determine a sequence of courses that will prepare them for acceptance into the IUG program. Normally a student would apply after the fourth semester and before the end of the sixth semester. For acceptance into the program students must successfully complete the following courses or their equivalent with a minimum average of 3.5 in their music courses, and a minimum GPA of 3.0: four semesters of music theory (MUSIC 131, MUSIC 132, MUSIC 231, MUSIC 331); four semesters of musicianship (MUSIC 121, MUSIC 122, MUSIC 221, MUSIC 222); three semesters of music history (MUSIC 162, MUSIC 261, MUSIC 262)

REDUCED COURSE LOAD: As many as twelve of the credits required for the master's degree may be applied to both undergraduate and graduate degree programs. A minimum of 50% of the courses proposed to count for both degrees must be at the 500 level. Thesis credits may not be double counted.

ELIGIBILITY FOR A GRADUATE ASSISTANTSHIP: Students in the IUG program will be eligible for a graduate assistantship starting in the beginning of the fifth year.

TUITION CHARGES: Undergraduate tuition rates will apply as long as the student is an undergraduate, unless the student received financial support, for example, an assistantship requiring the payment of graduate tuition (from "Information and Guidelines for Establishing Integrated Undergraduate - Graduate Degree Programs"—approved by the Graduate Council, May 8, 1996).

Integrated B.M. in Performance—M.A. in Musicology

The School of Music offers a limited number of academically superior students enrolled in the Bachelor of Music the opportunity to enroll in an integrated program leading to both the B.M. in Performance and the Master of Arts in Musicology in a continuous program of study culminating in both degrees. The ability to coordinate as well as concurrently pursue the two degree programs enables the student to achieve greater depth and comprehensiveness than if the degrees are pursued sequentially and to earn the two degrees in five years.

APPLICATION PROCESS: To initiate the application process, students must submit a transcript, faculty recommendation, writing sample, and statement of goals. A faculty adviser will help undergraduate candidates determine a sequence of courses that will prepare them for acceptance into the IUG program. Normally a student would apply after the fourth semester and before the end of the sixth semester. For acceptance into the program students must successfully complete the following courses or their equivalent with a minimum average of 3.5 in their music courses, and a minimum GPA of 3.0: four semesters of music theory (MUSIC 131, MUSIC 132, MUSIC 231, MUSIC 331); four semesters of musicianship (MUSIC 121, MUSIC 122, MUSIC 221, MUSIC 222); three semesters of music history (MUSIC 162, MUSIC 261, MUSIC 262)

REDUCED COURSE LOAD: As many as twelve of the credits required for the master's degree may be applied to both undergraduate and graduate degree programs. A minimum of 50% of the courses proposed to count for both degrees must be at the 500 level. Thesis credits may not be double counted.

ELIGIBILITY FOR A GRADUATE ASSISTANTSHIP: Students in the IUG program will be eligible for a graduate assistantship starting in the beginning of the fifth year.

TUITION CHARGES: Undergraduate tuition rates will apply as long as the student is an undergraduate, unless the student received financial support, for example, an assistantship requiring the payment of graduate tuition (from "Information and Guidelines for Establishing Integrated Undergraduate-Graduate Degree Programs"—approved by the Graduate Council, May 8, 1996).

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

[4] All performance majors must achieve the eighth-credit level in one foreign language.

MUSIC EDUCATION

College of Arts and Architecture

The Bachelor of Science degree in Music Education is a professional program that helps prepare students for teaching in elementary and secondary schools. Graduates of this program receive the Pennsylvania Instructional I certificate for teaching music K-12. They are expected to meet all special requirements for teacher certification and must pass proficiency examinations in voice and piano and complete all other education courses before registering for student teaching. (See also Teacher Education Programs.)

For the B.S. degree in Music Education, a minimum of 138 credits is required.

GENERAL EDUCATION: 45 credits
(6 of these credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 99 credits[1]
(This includes 6 credits of General Education GS courses.)

PRESCRIBED COURSES (44 credits)
MUSIC 040S(1), MUSIC 121(1), MUSIC 122(1), MUSIC 131(2), MUSIC 132(2), MUSIC 162(2) (Sem: 1-2)
MUSIC 140(2), MUSIC 221(1), MUSIC 222(1), MUSIC 231(2), MUSIC 261(3), MUSIC 262(3), MUSIC 266(1), MUSIC 331(2) (Sem: 3-4)
MUSIC 495D(1) (Sem: 5-6)
MUSIC 295A(1), MUSIC 332(2), MUSIC 340W(3), MUSIC 342(2), MUSIC 343(2), MUSIC 344(2), MUSIC 366(2), MUSIC 395A(1), SPLED 400(3) (Sem: 5-8)
MUSIC 101(1) (Sem: 7-8)

ADDITIONAL COURSES (42.5-43.5 credits)
Select 7 credits of approved ensembles as follows: MUSIC 076(1), MUSIC 077 GA(1), MUSIC 078 GA(1), MUSIC 080 GA(1), MUSIC 081 GA(1), MUSIC 082 GA(1), MUSIC 084 GA(1), MUSIC 085 GA(1), MUSIC 086 GA(1), MUSIC 087 GA(1), MUSIC 089 GA(1), MUSIC 090 GA(1), MUSIC 091 GA(1), MUSIC 092 GA(1), MUSIC 093 GA(1), MUSIC 094 GA(1), MUSIC 103 GA(1), MUSIC 104 GA(1), MUSIC 190 GA(1), MUSIC 191 GA (1), MUSIC 192 GA(1), MUSIC 467(1) (Sem: 1-8)
Select 14 credits in applied music through Primary Level VII (Sem: 1-8)
Select 6 credits from HD FS 229 GS(3), HD FS 239 GS(3), PSY 002 GS(3), PSY 213 GS(3) (Sem: 3-4)
Select 1 credit from MUSIC 395B(1), MUSIC 395C(1) (Sem: 5-8)
Select .5 credits from MUSIC 295B(.5), MUSIC 295C(.5) (Sem: 5-8)
Select 2-3 credits from MUSIC 181(2), MUSIC 182(2), MUSIC 267(2), MUSIC 336(2), MUSIC 422(3), MUSIC 431(2), MUSIC 433(2-3), MUSIC 438(2), MUSIC 471(2), MUSIC 472(2) (Sem: 5-8)
Select 12 credits from MUSIC 495A, MUSIC 495B, MUSIC 495C, as follows:
—5 or 7 credits from general music (495A) (Sem: 7-8)
—5 or 7 credits from choral or instrumental music (495B or C) (Sem· 7-8)

SUPPORTING COURSES AND RELATED AREAS (12.5 credits)
(Students may apply 6 credits of ROTC.)
Select 12.5 credits from MUSIC 110(1), MUSIC 112(.5-1), MUSIC 115(1), MUSIC 116(1), MUSIC 150(1), MUSIC 151(.5-2), MUSIC 152(.5-1), MUSIC 153(.5-1), MUSIC 154(.5), MUSIC 170(1), MUSIC 210(1), MUSIC 270(1), MUSIC 387(1), MUSIC 388(1), MUSIC 389(1), MUSIC 418(2), VOICE 100J GA(1), KEYBD 100J GA(1) (Sem: 1-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

MUSICAL ARTS

College of Arts and Architecture

The Bachelor of Musical Arts degree is a multidisciplinary or interdisciplinary program that is intended to prepare students for careers in performance, while developing a secondary area of emphasis outside of music, as determined for each student on the basis of an advising process. Completion of this program requires that the student achieve a high level of competence in order to begin professional work or pursue further studies at the graduate level.

Entrance into this program will be determined by departmental evaluation.

For the Bachelor of Musical Arts, a minimum of 133 credits is required.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 88 credits[1]

PRESCRIBED COURSES (27 credits)
MUSIC 121(1), MUSIC 122(1), MUSIC 129S(3), MUSIC 131(2), MUSIC 132(2), MUSIC 161(1), MUSIC 162W(1) (Sem: 1-2)
MUSIC 221(1), MUSIC 222(1), MUSIC 231(2), MUSIC 261(3), MUSIC 262(3), MUSIC 266(1) (Sem: 3-4)
MUSIC 331(2), MUSIC 332(2) (Sem: 5-6)
MUSIC 101(1) (Sem: 7-8)

ADDITIONAL COURSES (3 credits)
Select 3 credits from MUSIC 461W(3), MUSIC 462W(3), MUSIC 463W(3), or MUSIC 464W(3) (Sem: 5-6)

SUPPORTING COURSES AND RELATED AREAS (58 credits)
Select 21 credits in applied music through Level VIII of performance (Sem: 1-8)
Select 8 credits of approved ensembles (see School of Music Handbook for list of ensembles) (Sem: 1-8)
Select 24 credits in consultation with adviser in an area of study other than music (at least 12 credits must be at the 400 level) (Sem: 1-8)
Select 5 credits in music from department list (Sem: 5-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

NUCLEAR ENGINEERING

College of Engineering

Nuclear engineering, the practical application of the principles of nuclear science for the benefit of humankind, provides the engineer or scientist with an opportunity to work on challenging problems that are vitally important to the modern world. The goal of the program is to provide students with a strong academic background that enables them to pursue professional careers in nuclear and radiation-based industries, or to pursue graduate study in nuclear engineering or related fields such as medical physics, health physics, or another field of engineering.

Upon graduation, our students will:

—Demonstrate a knowledge of the fundamentals in mathematics, physics, chemistry and the engineering sciences necessary to the nuclear engineering profession.

—Demonstrate an ability to apply the fundamentals to understand, analyze, and design nuclear systems; demonstrate knowledge of the contemporary issues affecting the nuclear engineering profession.

—Demonstrate the ability to use appropriate methods and technology for measurement and collection of data, especially in radiation detection and nuclear science.

—Be proficient in the oral and written communication of their work and ideas; show the ability to learn independently using appropriate technology; show ability to work well in teams.

—Demonstrate the ability to operate in a modern, diverse work environment; understand their professional and ethical responsibilities; and be aware of the safety, environmental, and societal consequences of their work in a global context.

The first two years of the program stress fundamentals in mathematics, chemistry, physics, computer programming, and engineering sciences such as mechanics, materials, and thermodynamics. The last two years provide the breadth and depth in nuclear science, behavior of heat and fluids, reactor theory and engineering, and radiation measurement. The laboratory work includes experiments using the University's 1,000-kilowatt research reactor. Engineering design is incorporated in many courses from the freshman year to the senior year, but is particularly emphasized in the senior capstone design course, which integrates the critical elements of reactor theory, reactor engineering, safety considerations and economic optimization into a reactor design.

Many graduates are employed by electric power companies that use nuclear power plants, or by companies that help service and maintain those plants. They use their knowledge of engineering principles, radioactive decay, interactions of radiation with matter, and nuclear reactor behavior to help assure that the power plants meet the demand for reliable, economic electricity while ensuring a safe environment. To do this, graduates must be problem solvers who could develop and use complex computer models and sophisticated monitoring systems, design systems to handle radioactive waste, determine if the materials in the plant are becoming brittle or corroded, or manage the fuel in the reactor to get the maximum energy from it. Other graduates work in industries that use radioactivity or radiation to detect problems or monitor processes. Jobs are also found in branches of the government as designers of the next generation of reactors for submarines, aircraft carriers, or space probes, or to manage and clean up contaminated wastes. They could also be involved with regulation of nuclear power or radiation uses, or in research to develop advanced technologies that will be used in next-generation power plants. Graduates who want to further their education in the fields of health physics, radiation biology, or nuclear medical applications find this degree to be a useful preparation.

For the B.S. degree in Nuclear Engineering, a minimum of 129 credits is required. This baccalaureate program in Nuclear Engineering is accredited by the Engineering Accreditation Commission of ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202-4012; telephone 410-347-7700; or **www.abet.org**.

GENERAL EDUCATION: 45 credits
(21 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 105 credits
(This includes 21 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses; 3 credits of GWS courses.)

PRESCRIBED COURSES (89 credits)
CHEM 012 GN(3), CHEM 014 GN(1), ED&G 100(3), MATH 140 GQ(4), MATH 141 GQ(4), PHYS 211 GN(4), PHYS 212 GN(4) (Sem: 1-2)
E MCH 011(3), E MCH 012(3), E MCH 013(3), M E 030(3), MATH 230(4), MATH 251(4)[1], PHYS 214 GN(2) (Sem: 3-4)
E E 305(3), E MCH 215(2), E MCH 216(1), ENGL 202C GWS(3), M E 033(3), M E 412(3), NUC E 301(4)[1], NUC E 302(4)[1], NUC E 309(3), NUC E 310W(2), NUC E 450(3)[1] (Sem: 5-6)
NUC E 403(3), NUC E 430(3)[1], NUC E 431W(4), NUC E 451(3) (Sem: 7-8)

ADDITIONAL COURSES (13 credits)
Select 1 credit of First-Year Seminar (Sem: 1-2)
ECON 002 GS(3), ECON 004 GS(3), ECON 014 GS(3) or ENNEC 100 GS(3) (Sem: 1-2)
CMPSC 201C GQ(3) or CMPSC 201F GQ(3) (Sem: 3-4)
Select 6 credits in nuclear engineering courses from NUC E 405, NUC E 408, NUC E 409, NUC E 420, NUC E 428, NUC E 444, NUC E 445, NUC E 460, NUC E 470, NUC E 490, or 500-level NUC E courses with approval of adviser (Students may apply 3 credits of ROTC.) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (3 credits)
Select 3 credits in technical courses from program list of supporting courses and related areas (Students may apply 3 credits of ROTC.) (Sem: 7-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

NURSING

Altoona College; Capital College; Commonwealth College: Penn State Fayette, Mont Alto, New Kensington, Shenango, Worthington Scranton; College of Health and Human Development

This major prepares registered nurse students as professional practitioners in areas of health promotion and maintenance, illness care, and rehabilitation. The major in Nursing is accredited by The National League for Nursing Accrediting Commission (NLNAC), 61 Broadway, New York, NY 10006; 212-363-5555, Commission on Collegiate Nursing Education (CCNE). Part-time and full-time students with a registed nurse license may enroll in the major at University Park and at seven other Penn State locations (Altoona College, Capital College, and Commonwealth College: Fayette, Mont Alto, New Kensington, Shenango Valley, and Worthington Scranton).

Senate legislation 42-97 Credit by Portfolio Assessment enables students to receive credit for certain prescribed nursing courses. Students must carry liability insurance and have an annual health examination, and be certified in adult and child CPR when enrolled in any clinical courses. Students also are responsible for their own transportation to clinical settings and may need the use of a car. Criminal background and child abuse history clearances are required.

For the B.S. degree in Nursing, a minimum of 120 credits is required.

GENERAL EDUCATION: 45 credits
(20-22 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

INTERCULTURAL AND INTERNATIONAL COMPETENCE:(Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 2-5 credits

REQUIREMENTS FOR THE MAJOR: 92-93 credits[1]
(This includes 20-22 credits of General Education courses: 3 credit of GHA courses; 7-9 credits of GN courses; 4 credits of GQ courses; 6 credits of GS courses.)

PRESCRIBED COURSES (67 credits)
BIOL 129 GN(4), BIOL 141 GN(3), BIOL 142(1), HD FS 129 GS(3), MICRB 106 GN(3), MICRB 107 GN(1), NUTR 251 GHA(3), PSY 002 GS(3), STAT 200 GQ(4) (Sem: 1-4)
NURS 390(3)[38] (Sem: 3-4)
NURS 205(3)[37], NURS 215(3)[37], NURS 225(3)[37], NURS 230(4)[37], NURS 301(4)[37], NURS 310(4)[37], NURS 320(4)[37], NURS 406(4)[37], NURS 420(4)[37] (Sem: 5-6)
NURS 200W(3)[38], NURS 351(3)[38] (Sem: 5-6)

ADDITIONAL COURSES (19-20 credits)
CHEM 011(3); or CHEM 012 GN(3) and CHEM 014 GN(1) (Sem: 1-4)
SOC 001 GS(3) or SOC 005 GS(3) (Sem: 1-4)
Select 13 credits from a or b:
a. NURS 415 GI(4)[38], NURS 405(4)[38], NURS 418(3)[38], 2 credits from School-approved list (Sem: 7-8)
b. NURS 417 GI(4)[38], NURS 457(3)[38], NURS 418(3)[38], NURS 465(3)[38] (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits from courses on school-approved list in consultation with adviser (3 credits of which must be at the 400 level)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
[37] Credit by Portfolio Assessment
[38] Due to restricted enrollment, the School of Nursing assigns the semester in which students enroll in these courses and all course prerequisites must be successfully completed.

NURSING

College of Health and Human Development
This major prepares students to become professional practitioners in areas of health promotion and maintenance, illness care, and rehabilitation. After earning the bachelor of science degree in nursing, students are qualified to take the registered nurse examination for licensure by the State Board of Nursing. The Nursing major is accredited by The National League for Nursing Accrediting Commission (NLNAC), 61 Broadway, New York, NY 10006; 212-363-5555, the Commission on Collegiate Nursing Education (CCNE), and approved by the Pennsylvania State Board of Nursing. Students are admitted as freshmen into the major.

Full-time students are assigned to a rotation plan for scheduling clinical nursing courses at University Park campus and clinical settings in various locations. The rotation plan may require a summer session at the end of the sophomore year. Students may be required to reside at locations other than University Park campus in some semesters.

Students must carry liability insurance and have an annual health examination, and be certified in adult and child CPR when enrolled in any clinical courses. Students also are responsible for their own transportation to clinical settings and may need the use of a car. Criminal background and child abuse history clearances are required.

For the B.S. degree in Nursing, a minimum of 120 credits is required.

GENERAL EDUCATION: 45 credits
(20-22 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 6-9 credits

REQUIREMENTS FOR THE MAJOR: 88-89 credits[1]
(This includes 20-22 credits of General Education courses: 3 credit of GHA courses; 7-9 credits of GN courses; 4 credits of GQ courses; 6 credits of GS courses.)

PRESCRIBED COURSES (79 credits)
NURS 215(3)[38] (Sem: 1-2)
BIOL 129 GN(4), BIOL 141 GN(3), BIOL 142(1), HD FS 129 GS(3), MICRB 106 GN(3), MICRB 107 GN(1), NUTR 251 GHA(3), PSY 002 GS(3), STAT 200 GQ(4) (Sem: 1-4)
NURS 225(3)[38], NURS 230(4)[38] (Sem: 3-4)

NURS 200W(3)[38], NURS 205(3)[38], NURS 301(4)[38], NURS 302(4)[38], NURS 310(4)[38], NURS 320(4)[38], NURS 351(3)[38] (Sem: 5-6)
NURS 400(3)[38], NURS 405(4)[38], NURS 406(4)[38], NURS 415 GI(4)[38], NURS 420(4)[38] (Sem: 7-8)

ADDITIONAL COURSES (6-7 credits)
CHEM 011(3); or CHEM 012 GN(3) and CHEM 014 GN(1) (Sem: 1-4)
SOC 001 GS(3) or SOC 005 GS(3) (Sem: 1-4)

SUPPORTING COURSES AND RELATED AREAS (3 credits)
Select 3 credits from school-approved list in consultation with adviser, 3 credits of which must be at the 400 level (Sem: 7-8)
[1]A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
[38] Due to restricted enrollment, the School of Nursing assigns the semester in which students enroll in these courses and all course prerequisites must be successfully completed.

NUTRITIONAL SCIENCES

College of Health and Human Develoopment

The study of nutrition involves an in-depth knowledge of the physiological and biochemical aspects of nutrition and the role of social and economic factors as determinants of nutrition practices and their effect on physical well-being.

The student may select the Applied Sciences option and apply knowledge of nutrition and human behavior to improve the nutritional status of individuals and communities or apply nutrition principles and counseling skills to medical problems in clinical dietetics. Other emphases in nutrition education and communications, nutrition and food science, or nutrition and exercise science are possible within the Applied Sciences option. All graduates with the Applied Sciences option satisfy the current Didactic Program in Dietetics requirement for application to a dietetic internship accredited by the Commission on Accreditation of Dietetics Education (CADE). Upon satisfactory completion of an accredited dietetic internship, graduates are eligible to take the registration examination to earn the credential Registered Dietitian.

The Basic Sciences option emphasizes the laboratory aspects of nutrition and is recommended for students preparing for laboratory-based research, and graduate study, medicine and related health careers such as dentistry, optometry, physician assistant, physical therapy, and chiropractic. Students enrolled in the Basic Sciences option who want to become a Registered Dietitian should select all of the additional courses in the Didactic Program in Dietetics. A list of courses recommended for developing a specific competence within each option or to meet the academic requirements for a dietetic internship is available from the department office.

For the B.S. degree in Nutrition, a minimum of 120 credits is required.

APPLIED SCIENCES OPTION: This option integrates knowledge of psychology, anthropology, and sociology with nutrition and emphasizes the study of eating behaviors and their relationship to nutritional status. The option includes practical experience in food service management. Graduates of this option usually work in community agencies, the food industry, schools, clinics, hospitals, wellness centers, and private practice, or continue to graduate study in public health, exercise physiology, communications, business, nutrition, or related fields.

BASIC SCIENCES OPTION: This option emphasizes laboratory research and incorporates knowledge from chemistry, physiology, and physics. This option usually leads to a career in laboratory research in the pharmaceutical or food industry, government, or academia. Students wishing to enter medicine or other health-related professions should check with an adviser as early as possible for appropriate selection of supporting courses and co-curricular experiences.

GENERAL EDUCATION: 45 credits
(18-19 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 6 credits

REQUIREMENTS FOR THE MAJOR: 87 or 90 credits
(This includes 18-19 credits of General Education courses: Applied Sciences Option: 6 credits of GN courses; 4 credits of GQ courses; 6 credits of GS courses; 3 credits of GHA courses; or Basic Sciences Option: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GHA courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 36 credits

PRESCRIBED COURSES (33 credits)
BIOL 141 GN(3), CHEM 012 GN(3), NUTR 251 GHA(3)[1], NUTR 358(2)[1], STAT 200 GQ(4) (Sem: 1-3)
B M B 211(3)[1], NUTR 445(3)[1], NUTR 446(3)[1], NUTR 451(3)[1] (Sem: 5-7)
NUTR 452(3), NUTR 490W(3) (Sem: 7-8)

ADDITIONAL COURSES (3 credits)
CHEM 034(3) or CHEM 038(3) (Sem: 2-4)

REQUIREMENTS FOR THE OPTION: 51 or 54 credits

APPLIED SCIENCES OPTION: 54 credits

PRESCRIBED COURSES (21 credits)
MICRB 106 GN(3), MICRB 107 GN(1), NUTR 120(3), NUTR 360(3) (Sem: 4-6)
HRIM 329(2), HRIM 330(2), NUTR 456(2) (Sem: 5-6)
NUTR 370(1), NUTR 400(1), NUTR 453(3) (Sem: 7-8)

ADDITIONAL COURSES (12 credits)
AG BM 101GS(3), ECON 002 GS(3), ECON 004 GS(3), or ECON 014 GS(3) (Sem: 1-4)
H D FS 129GS(3) or PSY 002 GS(3) (Sem: 1-4)
H P A 332(3) or MGMT 100(3) (Sem: 3-5)
H P A 460(3), HRIM 365(3), MGMT 321(3), or PSY 231 GS(3) (Sem: 5-7)

SUPPORTING COURSES AND RELATED AREAS (21 credits)
Select 21 credits, in consultation with an adviser, from University-wide offerings that provide relevance to this option. See program list of recommended courses. (At least 9 credits must be at the 400 level and, of those, no more than 6 credits may be NUTR 496.) (Sem: 3-8)

BASIC SCIENCES OPTION: 51 credits

PRESCRIBED COURSES (32 credits)
BIOL 110 GN(4), BIOL 142(1), BIOL 230W GN(4), CHEM 013 GN(3), CHEM 014 GN(1), CHEM 015 GN(1), MATH 140 GQ(4) (Sem: 1-3)
B M B 212(1), MICRB 201(3), MICRB 202(2), PHYS 250 GN(4), PHYS 251 GN(4) (Sem: 3-4)

ADDITIONAL COURSES (3 credits)
CHEM 035(3) or CHEM 039(3) (Sem: 4-6)

SUPPORTING COURSES AND RELATED AREAS (16 credits)
Select 16 credits, in consultation with an adviser, from University-wide offerings that provide relevance to this option. See program list of recommended courses. (At least 9 credits must be at the 400 level and, of those, no more than 6 credits may be NUTR 496.) (Sem: 3-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

ORGANIZATIONAL LEADERSHIP

College of the Liberal Arts, offered only through World Campus
The degree draws on many of the disciplines of the liberal arts to illuminate the issues that all leaders face regarding work and employment issues in the 21st Century. Students select courses in English, crime, law, and justice, economics, political science, sociology, labor and industrial relations, communication arts and sciences, and psychology. The goal is to provide a broad education that introduces methods of analysis used in the disciplines of the liberal arts and prepares students to understand the complex social, cultural, and organizational issues that they will confront in leadership positions in the modern world. This degree program requires that students develop competency in four critical areas and then apply those skills in disciplinary perspectives. All students are expected to develop proficiency in research methodology, critical analysis, communication skills, and the application of theory. Students can expect to learn and practice skills that focus on understanding how organizations function both formally and informally and how individuals function within organizations.

For the B.S. degree in Organizational Leadership, a minimum of 123 credits is required.

GENERAL EDUCATION: 45 credits
(4 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in ELECTIVES, GENERAL EDUCATION course selections, or REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 18 credits

REQUIREMENTS FOR THE MAJOR: 64 credits[1]
(This includes 4 credits of General Education GQ courses.)

PRESCRIBED COURSES (25 credits)
CAS 283(3), ECON 002 GS(3), ECON 004 GS(3), ENGL 215(3), PSY 231 GS(3), PSY 451(3), SOC 207(3), STAT 200 GQ(4) (Sem: 1-5)

ADDITIONAL COURSES (39 credits)
Select 39 credits:
Choose at least 12 credits in each of the 3 following areas.
Choose at least 15 credits at the 400 level.
1. Employer and Employees
L I R 136 GI(3), PHIL 010 GH(3), PHIL 103 GH(3), PSY 002 GS(3), SOC 035(3) (Sem: 1-6)
HIST/L I R 458W(3), PSY 441(3), SOC 456(3) (Sem: 5-8)
2. Law, Policy, and Organizations
ADM J 111(3), L I R 100 GS(3), L I R 201 GS(3), PL SC 001 GS(3) (Sem: 1-6)
ADM J 482(3), L I R 424(3), L I R 435(3), PL SC 420(3) (Sem: 5-8)
3. Workplace Dynamics
CAS 352(3), CAS 452(3), CAS 475(3), ECON 315 GS(3), ECON 342 GS(3), SOC 404(3), SOC 455(3)(Sem: 4-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

PETROLEUM AND NATURAL GAS ENGINEERING

College of Earth and Mineral Sciences

The undergraduate curriculum in in petroleum and natural gas engineering has been designed to equip the student with the fundamentals necessary to achieve lifelong professional growth. Graduates are prepared to enter both the private and public sectors as petroleum and natural gas engineers or to pursue further education at the graduate level.

The courses are structured to serve as a melting pot for theory, application to case studies and engineering project design. This enables the student to appreciate and understand that a successful engineering design project requires a sound theoretical foundation, experimentation and engineering judgment. The thrust of the program structure emphasizes the fundamentals of mathematics and earth and engineering sciences and integrates them in application to traditional petroleum and natural gas engineering topics. Design projects are required throughout the curriculum. Execution of these projects requires an amalgamation of problem formulation strategies, testing of alternative design methodologies, feasibility studies, and economic and environmental considerations. Graduates of the program are expected to perform in various facets of the petroleum industry including drilling, production, evaluation, transportation and storage. The petroleum and natural gas engineering faculty and staff are committed to an interactive teaching and learning environment to ensure that the student is an active participant in the learning process. General education opportunities are sufficiently broad and diverse in scope to enable the student to tailor the educational experience to particular interests, background and expected role in society.

Integration of knowledge and skills acquired during the course of study enables the students/graduates of this program to do the following:

—Solve petroleum and natural gas engineering process problems using knowledge of applied mathematics, science, and economics.

—Acquire technical data, analyze them, and use them to design petroleum and natural gas engineering systems.

—Integrate professional, ethical, social, and environmental considerations into petroleum and natural gas engineering design and problem solving.

—Develop ability to communicate engineering results effectively and provide experience in team efforts.

—Acquire the habit of continuous learning to maintain technical competence and to keep abreast of contemporary issues.

The Petroleum and Natural Gas Engineering program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET).

For the B.S. degree in Petroleum and Natural Gas Engineering, a minimum of 128 credits is required.

GENERAL EDUCATION: 45 credits
(30 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 113 credits
(This includes 30 credits of General Education courses: 3 credits of GH courses; 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses; 9 credits of GWS courses.)
PRESCRIBED COURSES (98 credits)
CHEM 012 GN(3), CHEM 013 GN(3), CHEM 014 GN(1), ECON 002 GS(3), EM SC 100S GWS(3)[88] (Sem: 1-2)
MATH 140 GQ(4), MATH 141 GQ(4), MATH 230(4), MATH 251(4), PHYS 211 GN(4), PHYS 212 GN(4), PHYS 213 GN(2) (Sem: 1-4)
E MCH 012(3), E MCH 210(5)[77], GEOSC 001(3) (Sem: 3-4)
EGEE 301(5), GEOSC 454(3), P N G 405(3)[1], P N G 406(1)[1], P N G 410(3)[1], P N G 450(3)[1], P N G 451(1)[1], P N G 475(3)[1], P N G 489(3), P N G 490(1) (Sem: 5-6)
ENGL 202C GWS(3), P N G 420(4), P N G 425(3), P N G 430(3), P N G 440W(3), P N G 480(3), P N G 482(1), P N G 491(1), P N G 492(1) (Sem: 7-8)

ADDITIONAL COURSES (9 credits)
Select 9 credits: one course from categories a, b, and c.
a. ENGL 015 GWS(3) or ENGL 030 GWS(3) (Sem: 1-2)
b. PHIL 103 GH(3), PHIL 106 GH(3), PHIL 107 GH(3), or PHIL 233 GH(3) (Sem: 3-4)
c. CMPSC 201C GQ(3) or CMPSC 201F GQ(3) (Sem: 5-6)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits in consultation with adviser (Students may apply 6 credits of ROTC.) (Sem: 7-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
[77]Students at branch campuses and/or transfer students can substitute the combination of E MCH 011 and E MCH 013.
[88] The following substitutions are allowed for students attending campuses where the indicated course is not offered: CAS 100 GWS can be substituted for EM SC 100S GWS.

PHILOSOPHY

College of the Liberal Arts

This major in-depth study of fundamental issues that inescapably confront all persons. Topics include ethics, social and political philosophy, and esthetics—study of the good life, justice, and beauty; metaphysics, philosophy of mind, and philosophy of religion—study of the nature of reality, mind, body, and the meaning of life and death; epistemology, philosophy of science, and logic—study of the nature of knowledge, truth, objectivity, and principles of sound reasoning; and subjects such as comparative philosophies and world cultures, feminist theory, and philosophical issues in technology, language, education, and the professions of law, business, medicine, communications, engineering, and agriculture. These studies enhance imaginative, interpretive, analytical, critical, and communicative capacities. Majors thus may acquire intellectual abilities crucial for self-fulfillment, responsible participation in public life, and success in a wide range of careers—including law, business, education, journalism, medicine, and public service.

Majors pursue concentration in history of philosophy; humanities and arts; philosophy of science and mathematics; social sciences; the professions; or value studies. This is combined easily with minors, area studies, and concurrent majors. Qualified students participate in honors study and internships.

For the B.A. degree in Philosophy, a minimum of 124 credits is required.

GENERAL PHILOSOPHY OPTION: This option provides students with a concentration in the history of western philosophy and the historical development and impact of philosophical ideas and issues—from the ancient to the contemporary period. It is designed for all students who seek a broad liberal education, including students interested in graduate study in philosophy.

HUMANITIES AND ARTS OPTION: This option provides students with a concentration in philosophical issues in the arts, art history, literature, languages, history and religion. It is designed for all students primarily interested in the philosophical dimensions of the arts, humanities, and cultural studies, including students with career or further educational goals in these fields.

PHILOSOPHY OF SCIENCE AND MATHEMATICS OPTION: This option provides students with a concentration in philosophical issues in the life sciences, the physical sciences, mathematics, engineering, and technology. It is designed for all students primarily interested in the philosophical dimensions of the natural sciences, technology, and mathematics, including students with career or further educational goals in these fields.

SOCIAL SCIENCES OPTION: This option provides students with a concentration in philosophical issues in the social sciences, social and political theory, and education. It is designed for all students primarily interested in the philosophical dimensions of social thought and methodological and normative issues in the social sciences, educational theory, and public policy, including students with career or further educational goals in these fields.

PROFESSIONAL STUDIES OPTION: This option provides students with a concentration in philosophical issues and dimensions in the theory and practice of the professions of agriculture, business, engineering, journalism, law, and medicine and health care. It is designed for all students seeking a foundation in the

philosophical dimensions of these professions, including students who wish to combine humanistic study with career or further educational goals in these fields.

VALUE STUDIES OPTION: This option provides students with a concentration in philosophical issues in aesthetics, ethics, jurisprudence, religious thought, social and political theory, and everyday life. It is designed for students primarily interested in fundamental and practical questions of value in human existence, careers, and communities, including students with career or further educational goals in this area.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 25 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 30 credits[1]

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 9 credits

PRESCRIBED COURSES (3 credits)
PHIL 012 GQ(3) (Sem: 1-6)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits in philosophy at the 100 level (Sem: 1-6)

REQUIREMENTS FOR THE OPTIONS: 21 credits

GENERAL PHILOSOPHY OPTION: 21 credits

PRESCRIBED COURSES (6 credits)
PHIL 200(3), PHIL 202(3) (Sem: 3-6)
ADDITIONAL COURSES (6 credits)
Select 6 credits from PHIL 201, PHIL 203, PHIL 204 (Sem: 3-6)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 9 credits in philosophy at the 400 level, in consultation with adviser (Sem: 5-8)

HUMANITIES AND ARTS OPTION: 21 credits

ADDITIONAL COURSES (12 credits)
Select 9 credits in philosophy at the 200 level (Sem: 3-6)
Select 3 credits from PHIL 402, PHIL 409, PHIL 413, PHIL 422, PHIL 424, PHIL 429, PHIL 435 (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 6 additional credits in philosophy at the 400 level and 3 credits at the 400 level in a related arts or humanities discipline, in consultation with adviser (Sem: 5-8)

PHILOSOPHY OF SCIENCE AND MATHEMATICS OPTION: 21 credits

ADDITIONAL COURSES (12 credits)
Select 9 credits in philosophy at the 200 level (Sem: 3-6)
Select 3 credits from PHIL 407, PHIL 410, PHIL 412, PHIL 417, PHIL 425, PHIL 426, PHIL 427 (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 6 additional credits in philosophy at the 400 level and 3 credits at the 400 level in a mathematics or natural science discipline, in consultation with adviser (Sem: 5-8)

SOCIAL SCIENCES OPTION: 21 credits

ADDITIONAL COURSES (12 credits)
Select 9 credits in philosophy at the 200 level (Sem: 3-6)
Select 3 credits from PHIL 401, PHIL 408, PHIL 415, PHIL 416, PHIL 425, PHIL 438 (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 6 additional credits in philosophy at the 400 level and 3 credits at the 400 level in social science, in consultation with adviser (Sem: 5-8)

PROFESSIONAL STUDIES OPTION: 21 credits

ADDITIONAL COURSES (12 credits)
Select 9 credits in philosophy at the 200 level (Sem: 3-6)
Select 3 credits from PHIL 405, PHIL 406, PHIL 418, PHIL 423, PHIL 431, PHIL 432, PHIL 433, PHIL 435 (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 9 credits at the 400 level in a professional area outside philosophy, in consultation with adviser (Sem: 5-8)

VALUE STUDIES OPTION: 21 credits

ADDITIONAL COURSES (12 credits)
Select 9 credits in philosophy at the 200 level (Sem: 3-6)
Select 3 credits from PHIL 401, PHIL 403, PHIL 405, PHIL 407, PHIL 408, PHIL 409, PHIL 424, PHIL 435, PHIL 438 (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 6 additional credits in philosophy at the 400 level in value studies and 3 credits at the 400 level in another discipline in value studies, in consultation with adviser (Sem: 5-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

PHYSICS

Penn State Erie, The Behrend College

The major provides education in the fundamentals of physics and selected advanced topics to prepare graduates for graduate education or for careers in industry. Students have opportunities to participate in research with faculty. In addition to the traditional physics education offered in the General physics option, the option in applied physics, Computational Physics, provides preparation for careers in technological fields.

For the B.S. degree in Physics, a minimum of 123 credits is required. Each student must earn at least a grade of C in each 300- and 400-level course in the major field.

GENERAL EDUCATION: 45 credits
(18 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selections)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 1 credit

REQUIREMENTS FOR THE MAJOR: 95 credits
(This includes 18 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GWS courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 67 credits

PRESCRIBED COURSES (67 credits)
CHEM 012 GN(3), CHEM 013 GN(3), CHEM 014 GN(1), CHEM 015 GN(1), MATH 140 GQ(4), MATH 141 GQ(4) (Sem: 1-2)
PHYS 211 GN(4)[1], PHYS 212 GN(4)[1], PHYS 213 GN(2)[1], PHYS 214 GN(2)[1], PHYS 237(3)[1] (Sem: 1-4)
CSE 103GQ(4), ENGL 202C GWS(3) (Sem: 3-4)
MATH 220 GQ(2), MATH 230(4), MATH 251(4), PHYBD 400(3), PHYBD 419(3), PHYBD 420(3), PHYBD 421W(3), PHYBD 458(4), PHYBD 494(3) (Sem: 5-8)

REQUIREMENTS FOR THE OPTION: 28 credits

COMPUTATIONAL PHYSICS OPTION: 28 credits

PRESCRIBED COURSES (10 credits)
CSE 120(3) (Sem: 1-8)
MTHBD 423(3), PHYBD 402(4) (Sem: 5-8)

ADDITIONAL COURSES (15 credits)
Select 3 credits from CMPBD 410(3), CMPBD 411(3), or CMPBD 460(3) (Sem: 5-8)
Select 12 credits from EE BD 326(4), EE BD 471(3), EE BD 473 (3), ME BD 241(3), ME BD 423(3), MTHBD 424(3), PHYBD 410(3), PHYBD 412(3), PHYBD 444(l), PHYBD 494(1-3), and/or PHYBD 495(1-3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (3 credits)
Select 3 credits from a division-approved list (Sem: 1-8)

GENERAL PHYSICS OPTION: 28 credits

PRESCRIBED COURSES (3 credits)
PHYBD 410(3) (Sem: 5-8)

ADDITIONAL COURSES (12 credits)
Select 12 credits from MTHBD 422(3), MTHBD 423(3), MTHBD 424(3), PHYBD 402(4), PHYBD 412(3), PHYBD 444(l), PHYBD 494(1-3), and/or PHYBD 495(1-3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (13 credits)
Select one of the following two sequences:
a. Select 8 credits of a foreign language (Proficiency demo by examination or course work to the level of the second semester in a foreign language is required. If fewer than 8 credits are needed to reach the required proficiency, students choose selections from a division-approved list to make a total of 8 credits.) (Sem: 1-8)
Select 5 credits from a division-approved list (Sem: 1-8)
b. CSE 120(3) (Sem: 1-8)
Select 3 credits from CMPBD 410(3), CMPBD 411(3), or CMPBD 460(3) (Sem: 1-8)
Select 7 credits from a division-approved list (Sem: 1-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

PHYSICS

Eberly College of Science

This major provides a sound program of technical and general education for students planning a career in physics and related fields. In addition to the traditional physics education offered in the General Physics option, three other options, Acoustics, Electronics, and Medical Physics, provide opportunities for students in special related areas of a more applied nature, while a fifth option, Teaching, provides opportunities for teaching physics in secondary schools.

The Department of Physics offers an honors program in physics.

In order to be eligible for entrance to the Physics major, a student must have: 1) attained at least a 2.00 cumulative grade-point average; 2) completed CHEM 012 GN(3), MATH 140 GQ(4), MATH 141 GQ(4), PHYS 211 GN(4), and PHYS 212 GN(4), and earned a grade of C or better in each of these courses.

For the B.S. degree in Physics, a minimum of 124 credits is required.

GENERAL EDUCATION: 45 credits
(18-24 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 97-117 credits
(This includes 18-24 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GWS courses. In addition, the Teaching option includes 6 credits of GS courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 66 credits

PRESCRIBED COURSES (54 credits)
CHEM 012 GN(3)[1], CHEM 013 GN(3), CHEM 014 GN(1), CHEM 015 GN(1), MATH 140 GQ(4)[1], MATH 141 GQ(4)[1] (Sem: 1-2)
PHYS 237(3)[1] (Sem: 1-4)

ENGL 202C GWS(3), MATH 220 GQ(2), MATH 231(2), MATH 251(4) (Sem: 3-4)
MATH 405(3), MATH 406(3) (Sem: 5-6)
PHYS 400(3)[1], PHYS 410(4), PHYS 419(3)[1], PHYS 420(3), PHYS 444(2), PHYS 457W(3)[1] (Sem: 5-8)

ADDITIONAL COURSES (12 credits)
PHYS 211 GN(4)[1], PHYS 212 GN(4)[1], PHYS 213 GN(2)[1], PHYS 214 GN(2)[1] (Sem: 1-4)

REQUIREMENTS FOR THE OPTION: 31-51 credits

ACOUSTICS OPTION: 31 credits

PRESCRIBED COURSES (10 credits)
AERSP 308(3)[55] (Sem: 3-6)
PHYS 402(4), PHYS 443(3) (Sem: 5-8)

ADDITIONAL COURSES (12 credits)
CMPSC 201C GQ(3) or CMPSC 201F GQ(3)[63] (Sem: 3-6)
Select 9 credits from A E 458(3)[55], ACS 402(3), AERSP 412(3), CSD 230(3), E E 459(3)[55], E MCH 412(3)[55], M E 458(3)[55], PHYS 412(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 3 credits of natural science (GN) courses that are not listed in the major (Sem: 7-8)
Select 6 credits from program list (Sem: 7-8)

ELECTRONICS OPTION: 39 credits

PRESCRIBED COURSES (18 credits)
CSE 271(3), E E 210(4), E E 310(4), E E 350(4) (Sem: 3-6)
PHYS 412(3) (Sem: 5-8)

ADDITIONAL COURSES (12 credits)
CMPSC 201C GQ(3) or CMPSC 201F GQ(3)[63] (Sem: 5-6)
Select 3 credits from E E 311(3)[55], E E 320(3), or E E 367(3) (Sem: 5-8)
Select 6 credits from CSE 312(3), CSE 412(3), CSE 447(3), CSE 471(3), CSE 477(3), E E 412(3)[55], E E 413(3), E E 414(3), E E 418(3), E E 419(3), E E 420(3)[55], E E 432(3)[55], E E 438(3)[55], E E 453(3), E E 459(3), E E 485(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 6 credits from program list (Sem: 3-6)
Select 3 credits of natural science (GN) courses that are not listed in the major (Sem: 5-6)

GENERAL PHYSICS OPTION: 31-32 credits

ADDITIONAL COURSES (10-11 credits)
Select 6-7 credits from items a, b, and/or c (Sem: 7-8)
a. PHYS 401(3), PHYS 406(3), PHYS 411(3), PHYS 412(3), PHYS 413(3), PHYS 443(3), PHYS 461(3), or PHYS 496(1-18) (maximum of 3 credits)
b. PHYS 402 (4) or PHYS 458(4) (the course not selected below may be used)
c. ASTRO 410(3), ASTRO 440(3), or ASTRO 485(3) (only 3 credits of ASTRO courses may be used)
Select 4 credits from PHYS 402(4) or PHYS 458(4) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (21 credits)
Select 3 credits of natural science (GN) courses that are not listed in the major (Sem: 3-8)
Select 6 credits of science/technology courses from program list. These credits must be in the same discipline, other than Physics (Sem: 3-8)
Select 12 credits from program list; a maximum of 6 of the 12 credits may be from PHYS 496(1-18), SC 295(1-9), SC 395(1-9), or SC 495(1-9) (Sem: 3-8)

MEDICAL PHYSICS OPTION: 34-36 credits
This option enables the graduate to meet all of the academic requirements for a minor in bioengineering. Application for a certificate indicating the minor must be made to the Department of Bioengineering.

PRESCRIBED COURSES (16 credits)
CHEM 034(3), CHEM 035(3) (Sem: 3-4)
PHYS 402(4) (Sem: 5-6)
BIOE 401(3), BIOE 402(3) (Sem: 7-8)

ADDITIONAL COURSES (12-14 credits)
BIOL 110 GN(4), BIOL 240W GN(4), BIOL 472(3); or B M B 251(3), B M B 252(3), BIOL 141 GN(3) (Sem: 3-6)
Select 3 credits from 400- or 500-level BIOE[57] courses (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits from program list (Sem: 5-8)

TEACHING OPTION: 51 credits
This option enables the graduate to meet all of the academic requirements for the Instructional I certificate for teaching at the secondary school level, which is provided by the Commonwealth. Students interested in this option should read carefully the section on Teacher Education Programs in this Bulletin.

PRESCRIBED COURSES (48 credits)[53]
EDPSY 014(3), EDTHP 115(3), PSY 002 GS(3), PSY 426(3), S T S 200 GS(3) (Sem: 3-6)
C I 295(2), C I 412W(3), C I 495C(3), C I 495E(15) (Sem: 5-8)
BIOL 011 GN(3), BIOL 012 GN(1), SCIED 411(3), SCIED 412(3) (Sem: 7-8)

ADDITIONAL COURSES (3 credits)[53]
Select 3 credits from EDTHP 401(3), EDTHP 416(3), EDTHP 430(3), or EDTHP 440(3) (Sem: 7-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
[53] A grade of C or better per course is required for teacher certification.
[55] The listed non-mathematical prerequisite for AERSP 308(3) is satisfied by PHYS 402(4), PHYS 419(3), and PHYS 443(3); for A E 458(3) by ACS 402(3) or PHYS 443(3); for E E 459(3) by PHYS 402(4), PHYS 419(3), and PHYS 443(3); for E MCH 412(3) by PHYS 419(3) and PHYS 443(3); for M E 458(3) by AERSP 308(3) and PHYS 420(3); for E E 311(3) by replacing E SC 314(3) with PHYS 412(3); for E E 320(3), E E 412(3), and E E 420(3) by replacing E E 330(4) with PHYS 400(3); for E E 432(3) and E E 438(3) by replacing E E 330(4) with PHYS 400(3); for E E 459(3) by PHYS 402(4), PHYS 419(3), and PHYS 443(3).
[57] Student must have seventh-semester status and a minimum GPA of 3.50.

PLASTICS ENGINEERING TECHNOLOGY

Penn State Erie, The Behrend College

This major is a TAC of ABET-accredited program that may be taken either as a four-year baccalaureate program or in a "2+2" degree format. The latter allows graduates of associate degree programs in plastics engineering technology or related areas to gain greater breadth and depth of knowledge in plastics engineering technology.

Students receive extensive "hands-on" experience in the college's state-of-the-art processing laboratory, where they learn the fundamentals of operating equipment used in the plastics industry and gain an understanding of how the various mechanical, hydraulic, and electrical systems of processing machinery interact to form a plastic product. The curriculum encompasses all of the major processing methods but emphasizes injection molding. Students are encouraged to do original research and to publish in the areas of plastics processing, part design, and mold design. The curriculum includes applied mathematics, physics, inorganic and polymer chemistry, fundamental and advanced topics dealing with chemical and physical properties of plastics materials and their processing characteristics, and an in-depth look at part and mold design utilizing computer-aided technology. Quality control and technical communications are also included. This program is accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology.

Graduates are qualified for positions in plastics processing, part design, tooling design, plant engineering, production control, and technical sales in the plastics industry.

For the B.S. degree in Plastics Engineering Technology, a minimum of 133 credits is required. Each student must earn at least a grade of C in each 300- and 400-level course in the major field.

GENERAL EDUCATION: 45 credits
(16 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 1 credit

REQUIREMENTS FOR THE MAJOR: 103 credits
(This includes 16 credits of General Education courses: 7 credits of GN courses; 6 credits of GQ courses; 3 credits of GWS courses.)

PRESCRIBED COURSES (87 credits)
PL ET 050(3), METBD 110(3), METBD 111(3), IE T 101(3)[1], MCH T 111(3)[1], PHYS 150 GN(3) (Sem: 1-2)
CHEM 012 GN(3), CHEM 014 GN(1), MCH T 213(3)[1], PL ET 205(3)[1], PL ET 206(3)[1], PL ET 217(3)[1], PL ET 234(4)[1], PL ET 270(3)[1], Q C 200(2)[1](Sem: 3-4)
ENGL 202C GWS(3) (Sem: 3-6)
CHMBD 202(3), METBD 307(3), METBD 317(3), MTHBD 210(4), MTHBD 211(4), PL ET 340(3), PL ET 350(4), PL ET 366(4), PL ET 370(3) (Sem: 5-6)
PL ET 494A(3) (Sem: 5-8)
PL ET 400W(3), PL ET 440(4) (Sem: 7-8)

ADDITIONAL COURSES (10 credits)
MATH 081 GQ(3)[1], MATH 082 GQ(3)[1], MATH 083 GQ(4)[1]; or MTHBD 091 GQ(5)[1], MTHBD 092 GQ(5)[1] (Sem, 1-4)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits of technical electives from School-approved list. (Sem: 7-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

POLITICAL SCIENCE

Penn State Erie, The Behrend College

The discipline of political science consists of different related subfields such as American government, international relations, public policy and administration, the study of how governments accomplish objectives, and comparative politics, the study of foreign government. The major offers students the opportunity to take course work in most subfields as well as seek practical experience through an internship. All students are encouraged to develop research and writing and statistical skills. Many students have continued their education in law or graduate school.

For the B.A. degree in Political Science, a minimum of 124 credits is required. Each student must earn at least a grade of C in each 300- and 400-level course in the major field.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 19 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 36 credits

PRESCRIBED COURSES (6 credits)
PL SC 001 GS(3), PL SC 003 GS(3) (Sem: 1-4)

ADDITIONAL COURSES (6 credits)
INTST 100 GS;GI(3) or PL SC 014 GS(3) (Sem: 1-4)
PL SC 017 GS(3) or PL SC 017W GS(3) (Sem: 1-4)

SUPPORTING COURSES AND RELATED AREAS (24 credits)
(In meeting this requirement, select at least one course beyond the prescribed and additional courses listed above from each of the four fields offered in the program: American Government, Comparative Politics, International Politics, and Government in Theory and Practice.)
Select 12 credits at any level from a program-approved list (Sem: 1-8)
Select 12 credits at the 400 level from a program-approved list (Sem: 3-8)

POLITICAL SCIENCE

College of the Liberal Arts

The Political Science major offers the student an opportunity to understand not only American federal, state, and local governments, but also the political systems of other nations and the philosophies that underlie them. Courses are offered in American, comparative, and international politics, and in political theory and methodology. Internship opportunities are available.

For the B.A. degree in Political Science, a minimum of 123 credits is required.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selections)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selections, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in ELECTIVES, GENERAL EDUCATION course selections, or REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 18 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 36 credits[1]

SUPPORTING COURSES AND RELATED AREAS (36 credits)
(In meeting these requirements, students must take at least one course at any level from the four fields offered in the department: Political Theory/Methodology, American Politics/Public Administration, Comparative Politics, and International Relations)
Select 12 credits from below the 400 level (Sem: 1-6)
Select 15 credits from the 400 level and above in political science (Sem: 3-8)
Select 9 credits in political science or in related disciplines from departmental list of approved courses. Substitutions may be made with the written permission of the faculty adviser. (Sem: 3-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

PREMEDICAL-MEDICAL

Eberly College of Science
This is a special accelerated accelerated program in cooperation with the College of Medicine at Thomas Jefferson University in Philadelphia whereby exceptional students have the opportunity to earn both the B.S. and M.D. degrees in six years. Students are selected for this program while they are seniors in high school and must begin their undergraduate studies the summer immediately following their graduation. The first two years of the program are completed at University Park and the next four at Jefferson. The Penn State B.S. degree in Science is awarded after completion of 82 Penn State credits and the first two years of the standard curriculum at Jefferson Medical College.

GENERAL EDUCATION: 45 credits
(15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in GENERAL EDUCATION course selection)

ELECTIVES: 0-1 credit

REQUIREMENTS FOR THE MAJOR: 51-53 credits
(This includes 15 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses.)

PRESCRIBED COURSES (41 credits)
BIOL 110 GN(4)[1], CHEM 012 GN(3)[1], CHEM 013 GN(3)[1], CHEM 014 GN(1)[1], CHEM 015 GN(1)[1], MATH 140 GQ(4)[1], MATH 141 GQ(4)[1] (Sem: 1-2)
CHEM 038(4), CHEM 039(3), CHEM 036(2), PHYS 201 GN(4), PHYS 202 GN(4), PHYS 204 GN(4) (Sem: 3-4)

ADDITIONAL COURSES (at Jefferson Medical)
Anatomy (Sem: 5-6)
Physiology (Sem: 5-6)
Histology (Sem: 5-6)
Biochemistry (Sem: 5-6)
Biostatistics (Sem: 5-6)
Neuroscience (Sem: 5-6)
Mechanisms of Disease (Sem: 5-6)
Introduction to Clinical Medicine (Sem: 5-8)
Medicine and Society (Sem: 5-8)
Microbiology/Immunology (Sem: 7-8)

Pathology (Sem: 7-8)
Pharmacology (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (10-12 credits)
Select 4-5 credits of life science with lab (Sem: 1-4)
Select 3 credits from program list (Sem: 1-4)
Select 3-4 credits of life science (Sem: 3-4)

Note: Students must take at least 9 of the Penn State credits listed above during the summer session prior to the first semester. Depending on advanced placement credit and schedule load, it might also be necessary to enroll during one of the other summer sessions before entering Jefferson Medical College at semester five.
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

PREMEDICINE

Eberly College of Science

This major provides a broad foundation necessary to the understanding of the basic subjects of modern medical studies. The curriculum, which offers a good balance between science and nonscience courses, constitutes an excellent preparation for admission to medical school. It also gives students the freedom to tailor the program to meet their individual needs by permitting a generous number of supporting courses. Specific admission requirements or recommendations of a particular medical school, not already in the required courses of the major, may be included among the supporting courses. Many students also use their supporting courses to pursue a minor.

In order to be eligible for entrance to the Premedicine major, a student must have: 1) attained at least a 2.00 cumulative grade-point average; and 2) completed BIOL 110 GN(4), CHEM 012 GN(3), and MATH 140 GQ(4), and earned a grade of C or better in each of these courses.

For the B.S. degree in Premedicine, a minimum of 126 credits is required, with at least 18 credits at the 400 level.

THREE-YEAR ALTERNATIVE: A student may also become eligible for the Bachelor of Science degree in this major upon satisfactory completion of:
a. A total of 96 credits, including General Education credits in Writing/Speaking, Health Sciences and Physical Education, and Arts, Humanities, and Social and Behavioral Sciences; 8 credits in a single foreign language; BIOL 110 GN(4), BIOL 230W GN(4); CHEM 012 GN(3), CHEM 013 GN(3), CHEM 014 GN(1), CHEM 015 GN(1), CHEM 036(2)[1], CHEM 038(3)[1], CHEM 039(3)[1]; MATH 140 GQ(4), MATH 141 GQ(4); PHYS 211 GN(4)[1], PHYS 212 GN(4)[1], PHYS 213 GN(2)[1] and PHYS 214 GN(2)[1].
b. The first year of an accredited medical or dental postgraduate program.

GENERAL EDUCATION: 45 credits
(18 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in GENERAL EDUCATION course selection or REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 99 credits
(This includes 18 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GHA courses.)

PRESCRIBED COURSES (53 credits)
BIOL 110 GN(4)[1], BIOL 110 230W GN(4)[1], CHEM 012 GN(3)[1], CHEM 013 GN(3)[1], CHEM 014 GN(1)[1], CHEM 015 GN(1)[1], MATH 140 GQ(4)[1], MATH 141 GQ(4)[1], NUTR 251 GHS(3)[1] (Sem: 1-2)
H P A 101(3), PHIL 432(3) (Sem: 1-6)
CHEM 036(2)[1], CHEM 038(3)[1], CHEM 039(3)[1] (Sem: 3-4)
PHYS 211 GN(4)[1], PHYS 212 GN(4)[1], PHYS 213 GN(2)[1], and PHYS 214 GN(2)[1] (Sem: 3-6)

ADDITIONAL COURSES (16-20 credits)
Select 4-5 credits from BIOL 220W GN(4), BIOL 240W GN(4), MICRB 201(3)/MICRB 202(2) (Sem: 3-8)
Select 3-4 credits from CMPSC 101 GQ(3), CSE 103 GQ(4), STAT 250 GQ(3) (Sem: 3-8)
Select 4-5 credits[1] from BIOL 421(4), BIOL 437(4), BIOL 472(3)/BIOL 473(2), MICRB 412(3)/422(2) (Sem: 5-8)
Select 5-6 credits[1] from B M B 400(3), B M B 401(2); B M B 401(2), B M B 402(3); or CHEM 451(3), CHEM 452(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (26-30 credits)
Select 0-8 credits in a foreign language (proficiency demonstrated by examination or course work to the level of the second semester; if fewer than 8 credits are needed to reach the required proficiency, students choose selections from program list to total 8 credits) (Sem: 1-8)
Select 18-30 credits from program list (A maximum of 12 credits of Independent Study [296, 496] may be applied toward credits for graduation.) (Sem: 1-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

PROFESSIONAL WRITING

Berks-Lehigh Valley College
The major is intended to prepare students to write effectively in a variety of workplace and academic settings. Methods of instruction draw upon the strategies and techniques of practicing writers outside of the University, including workshops, peer conferencing, collaborative writing, portfolio preparation, and internships. At the same time, theory courses provide the necessary background to help students understand and appreciate the larger issues surrounding the writing and reading of texts.

As a liberal arts degree, the Professional Writing major is appropriate for students who wish to develop a set of applied communication skills to prepare for a wide range of professional positions or for graduate or professional schools. The degree differs from most current English majors in at least three ways: 1) a practical orientation prepares graduates for employment, in addition to post-graduate English studies; 2) a multidisciplinary focus integrates courses from the liberal arts, business, and information technology; and 3) a required internship ensures that students actively apply their skills.

For the B.A. degree in Professional Writing, a minimum of 126 credits is required.

GENERAL EDUCATION: 45 credits

FIRST-YEAR SEMINAR (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

ELECTIVES: 15 credits

REQUIREMENTS FOR THE MAJOR: 42 credits [1]

PRESCRIBED COURSES (15 credits)
ENGL 210(3) (Sem: 3-4)
ENGL 471(3), L A 283(3) (Sem: 5-6)
ENGL 495(3) (Sem: 5-8)
ENGL 417(3) (Sem: 7-8)

ADDITIONAL COURSES (27 credits)

a. Creative Writing and Literature
Select 6 credits from the following list or 6 credits in Creative Writing or Literature at 200 level or higher approved by the Degree Coordinator:
ENGL 200(3), ENGL 212(3), ENGL 213(3), ENGL 221W(3), ENGL 222W(3), ENGL 231W(3), ENGL 232W(3), ENGL 400(3), ENGL 402(3), ENGL 403(3), ENGL 483(3) (Sem: 3-4)
b. Rhetorical Theory
Select 6 credits from the following list:
ENGL 472(3), ENGL 473(3), ENGL 474(3) (Sem: 5-8)
c. Professional Writing
Select 9 credits from the following list:
ENGL 215(3), ENGL 415(3), ENGL 418(3), ENGL 419(3), ENGL 416(3), ENGL 421(3) (Sem: 5-8)
d. Cognate Courses
Select 6 credits from the following list or in a cognate area approved by the Degree Coordinator:
B A 321(3), CAS 214W(3), CAS 352(3), COMM 260W(3), ENGL 250(3), PHIL 406(3), PHIL 418(3), PSY 217 GS(3) (Sem: 5-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

PSYCHOLOGICAL AND SOCIAL SCIENCE, B.A.

Abington College

Building on the interdisciplinary and cross-disciplinary strengths of Penn State Abington, the Psychological and Social Science B.A. is designed to respond to the demand for a program emphasizing the social and behavioral sciences leading to an understanding of human behavior and its influence upon society as well as the influence of social forces on individuals. The program is distinguished by its interdisciplinary and cross-disciplinary course work and required field experience. The B.A. provides a broad theoretical foundation in social and psychological theory as well as the opportunity to engage in supervised field experience. The major offers students a choice of course clusters focused on specialized areas such as social psychology, developmental studies, organizational behavior and leadership, bio-behavior and diversity, and counseling. The major is designed to prepare students for a variety of career fields including human resources, business administration, mental health, and social work as well as for continued study in graduate or professional school.

For the B. A. degree in Psychological and Social Science, a minimum of 121 credits is required.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 5-6 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 46-47 credits[1]

PRESCRIBED COURSES (10 credits)
PSY 002 GS(3) (Sem: 1-2)
ANTH 045 GS;DF(3) (Sem: 1-4)
PSY 015(4) (Sem: 3-4)

ADDITIONAL COURSES (15-16 credits)
SOC 109(3) or PSY 238 GS(3) (Sem: 1-4)
HD FS 129 GS(3) or PSY 213 GS(3) (Sem: 1-4)
PSY 201W(4) or HD FS 312W(3) (Sem: 3-4)
BB H 301(3) or HD FS 301(3) (Sem: 3-6)
Select 3 credits of ANTH 495(1-18), HD FS 495C(3-8), PSY 495(1-15), or SOC 495(1-18) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (21 credits)
Select 12 credits from one of the following areas
Select 9 credits from a second area
(at least 15 credits must be at the 400 level):

a. Organizational Relations
CAS 352(3), PSY 231 GS(3), PSY 451(3), PSY 475(3), MGMT 341(3), MGMT 441(3), SOC 455(3), SOC 456(3), SPCOM 455 GI(3) (Sem: 5-8)

b. Social Psychology
SOC 003 GS(3), PSY 217 GS(3), PSY 417(3), PSY 477(3), SOC 403(3) (Sem: 5-8)

c. Developmental Studies
EDPSY 014(3), HD FS 229 GS(3), HD FS 239 GS(3), HD FS 249 GS(3), HD FS 315 DF(3), HD FS 433(3), HD FS 445(3)/PSY 445(3), PSY 425(3), PSY 426(3) (Sem: 5-8)

d. Media and Society
CAS 415(3 per semester), COMM 100 GS(3), COMM 120(3), COMM 411(3), SOC 462(3) (Sem: 5-8)

[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

PSYCHOLOGICAL AND SOCIAL SCIENCE, B.S.

Abington College

Building on the interdisciplinary and cross-disciplinary strengths of Penn State Abington, the Psychological and Social Science B.S. is designed to respond to the demand for a program emphasizing the social and behavioral sciences leading to an understanding of human behavior and its influence upon society as well as the influence of social forces on individuals. The program is distinguished by its interdisciplinary and cross-disciplinary course work and required field experience. The degree program offers students a choice of course clusters focused on specialized areas such as social psychology, developmental studies, organizational behavior and

leadership, bio-behavior and diversity, and counseling. The B.S. provides a broad theoretical foundation in social and psychological theory as well as the opportunity to engage in supervised field experience. In addition, the B.S. degree emphasizes quantitative research skills and requires the completion of a senior thesis. The major is designed to prepare students for a variety of career fields including human resources, business administration, mental health, and social work as well as for continued study in graduate or professional school.

For the B.S. degree in Psychological and Social Science, a minimum of 120 credits is required.

GENERAL EDUCATION: 45 credits
(7-8 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE:(Included in REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 12-17 credits

REQUIREMENTS FOR THE MAJOR: 66-70 credits[1]
(This includes 7-8 credits of General Education courses: 3-4 credits of GN courses; 4 credits of GQ courses.)

PRESCRIBED COURSES (17 credits)
MATH 110 GQ(4), PSY 002 GS(3) (Sem: 1-2)
ANTH 045 GS;DF(3) (Sem: 1-4)
PSY 015(4) (Sem: 3-4)
SOC 471(3) (Sem: 7-8)

ADDITIONAL COURSES (28-32 credits)
BIOL 110 GN(4) or BIOL 141 GN(3) and BIOL 142(1) (Sem: 1-4)
SOC 109(3) or PSY 238 GS(3) (Sem: 3-4)
HD FS 129 GS(3) or PSY 213 GS(3) (Sem: 1-4)
PSY 201W(4) or HD FS 312W(3) (Sem: 3-4)
BB H 301(3) or HD FS 301(3) (Sem: 3-6)
CAS 352(3) or SPCOM 455 GI(3) (Sem: 5-8)
PSY 301A(3), PSY 301B(3), PSY 301C(3), PSY 301D(3), PSY 301E(3), or PSY 301F(3) (Sem: 7-8)
Select 3 credits of ANTH 495(1-18), HD FS 495C(3-8), PSY 495(1-15), or SOC 495(1-18) (Sem: 7-8)
Select 3-6 credits of ANTH 494(1-12), HD FS 494(1-12), PSY 494(3-6), or SOC 494(1-12) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (21 credits)
Select 12 credits from one of the following areas
Select 9 credits from a second area
(at least 12 credits must be at the 400 level):
a. Society and Health
ANTH 464(3)/BIOL 464(3), BIOL 469(3)/BB H 469(3), BB H 302 GI(3), BB H 315 GI(3), HD FS 468(3), PSY 487(3), SOC 309(3) (Sem: 5-8)
b. Counseling and Testing
CNED 403(3), CNED 404(3), CNED 407(3), CNED 425(3) (Sem: 5-8)
c. Developmental Studies
EDPSY 014(3), HD FS 229 GS(3), HD FS 239 GS(3), HD FS 249 GS(3), HD FS 315 DF(3), HD FS 433(3), HD FS 445(3)/PSY 445(3), PSY 425(3), PSY 426(3) (Sem: 5-8)
d. Organizational Relations
MGMT 321(3), MGMT 331(3), MGMT 341(3), MGMT 424(3), SOC 455(3), SOC 456(3) (Sem: 5-8)
e. Social Psychology
SOC 003 GS(3), SOC 403(3), PSY 217 GS(3), PSY 417(3), PSY 477(3) (Sem: 5-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

PSYCHOLOGY, B.A.

Altoona College

The Psychology major will combine the knowledge, skills, and values of psychology with a liberal arts foundation. Students should develop a knowledge base consisting of concepts, theory, empirical findings, and trends within psychology; understand and apply basic research methods in psychology; use critical thinking and the scientific approach to solve problems related to behavior and mental processes; apply psychological principles to personal and social issues; and be able to understand the gender, race, ethnicity, culture, and class issues in psychological theory, research, and practice. Students should also develop information and computer competence, communication skills, and develop realistic ideas about how to implement their psychology

education in occupational pursuits in a variety of settings. The major may lead to either a Bachelor of Arts or a Bachelor of Science degree. The B.A. degree incorporates a broad exposure to the many facets of the field of psychology, in addition to the B.A. requirements. The B.S. degree provides the same exposure to the field of psychology and adds options in Science and Business to prepare students for more specific career directions. Students in both degree programs may also prepare for graduate school; research experience with faculty members is encouraged for such students. Admission to and retention in the Psychology major requires a 2.0 GPA and a minimum grade of 2.0 in all psychology courses.

For the B.A. degree in Psychology, a minimum of 124 credits is required.

GENERAL EDUCATION: 45 credits
(0-4 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 14-26 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 16-24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 37-41 credits[1]
(This includes 0-4 credits of General Education GQ courses.)

PRESCRIBED COURSES (7 credits)
PSY 002 GS(3) (Sem: 1-4)
PSY 201W(4) (Sem: 3-6)

ADDITIONAL COURSES (30-34 credits)
(Must include 15 credits at 400 level.)
PSY 015(4) or STAT 200 GQ(4) (Sem: 3-4)

Select 18 credits—a minimum of 3 credits from each of the following six categories (may not double count PSY 411 or PSYCH 440 for category e. requirement):

a. Learning and Cognition: PSY 204 GS(3), PSY 221 GS(3), PSY 404(3), PSY 430(3) (Sem: 2-8)

b. Individual Differences, Personality, and Social Processes: PSY 217 GS(3), PSY 238 GS(3), PSY 243 GS(3), PSY 412(3), PSY 437(3) (Sem: 2-8)

c. Biological Bases of Behavior and Mental Processes: PSY 202 GS(3), PSY 203(3), PSY 209(3), PSY 407(3), PSY 483(3) (Sem: 2-8)

d. Developmental Changes in Behavior and Mental Processes Across the Life Span: PSY 213 GS(3), PSY 423(3), PSY 424(3), PSY 426(3), PSY 445(3)/HD FS 445(3) (Sem: 2-8)

e. History of Psychology, Socio-cultural Contexts, and Diversity Issues: PSY 237 GS(3)/RL ST 237 GS(3), PSY 270 GS;GI(3), PSY 411(3), PSY 414(3)/RL ST 414(3), PSYCH 440(3) (Sem: 2-8)

f. Capstone Experience: PSY 411(3), PSY 493(3-6), PSY 494(3-18), PSY 495(6-15), PSY 496(3-18), PSYCH 440(3) (Sem: 7-8)

Select 8-12 credits of additional Psychology courses from any offered for a total of 30 credits of Psychology courses beyond PSY 002 and PSY 201W (Sem: 2-8)

[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

PSYCHOLOGY, B.S.

Altoona College

The Psychology major will combine the knowledge, skills, and values of psychology with a liberal arts foundation. Students should develop a knowledge base consisting of concepts, theory, empirical findings, and trends within psychology; understand and apply basic research methods in psychology; use critical thinking and the scientific approach to solve problems related to behavior and mental processes; apply psychological principles to personal and social issues; and be able to understand the gender, race, ethnicity, culture, and class issues in psychological theory, research, and practice. Students should also develop information and computer competence, communication skills, and develop realistic ideas about how to implement their psychology education in occupational pursuits in a variety of settings. The major may lead to either a Bachelor of Arts or a Bachelor of Science degree. The B.A. degree incorporates a broad exposure to the many facets of the field of psychology, in addition to the B.A. requirements. The B.S. degree provides the same exposure to the field of psychology and adds options in Science and Business to prepare students for more specific career directions. Students in both degree programs may also prepare for graduate school; research experience with faculty

members is encouraged for such students. Admission to and retention in the Psychology major requires a 2.0 GPA and a minimum grade of 2.0 in all psychology courses.

For the B.S. degree in Psychology, a minimum of 124 credits is required.

GENERAL EDUCATION: 45 credits
(0-4 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 12-18 credits

REQUIREMENTS FOR THE MAJOR: 61-65 credits [1]
(This includes 0-4 credits of General Education GQ courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 41 credits

PRESCRIBED COURSES (7 credits)
PSY 002 GS(3) (Sem: 1-4)
PSY 201W(4) (Sem: 3-6)

ADDITIONAL COURSES (34 credits)
(Must include 15 credits at the 400 level.)
PSY 015(4) or STAT 200 GQ(4) (Sem: 3-4)

Select 18 credits—a minimum of 3 credits from each of the following six categories (may not double count PSY 411 or PSYCH 440 for category e. requirement):

a. Learning and Cognition: PSY 204 GS(3), PSY 221 GS(3), PSY 404(3), PSY 430(3) (Sem: 2-8)

b. Individual Differences, Personality, and Social Processes: PSY 217 GS(3), PSY 238 GS(3), PSY 243 GS(3), PSY 412(3), PSY 437(3) (Sem: 2-8)

c. Biological Bases of Behavior and Mental Processes: PSY 202 GS(3), PSY 203(3), PSY 209(3), PSY 407(3), PSY 483(3) (Sem: 2-8)

d. Developmental Changes in Behavior and Mental Processes Across the Life Span: PSY 213 GS(3), PSY 423(3), PSY 424(3), PSY 426(3), PSY 445(3)/HD FS 445(3) (Sem: 2-8)

e. History of Psychology, Socio-cultural Contexts, and Diversity Issues: PSY 237 GS(3)/RL ST 237 GS(3), PSY 270 GS;GI(3), PSY 411(3), PSY 414(3)/RL ST 414(3), PSYCH 440(3) (Sem: 2-8)

f. Capstone Experience: PSY 411(3), PSY 493(3-6), PSY 494(3-18), PSY 495(6-15), PSY 496(3-18), PSYCH 440(3)(Sem: 7-8)

Select 8-12 credits of additional Psychology courses from any offered for a total of 30 credits of Psychology courses beyond PSY 002 and PSY 201W (Sem: 2-8)

REQUIREMENTS FOR THE OPTION: 24 credits

SCIENCE OPTION: 24 credits

ADDITIONAL COURSES (15 credits)
Select 15 credits from: ANTH 021 GN(3); BB H 101 GHA(3); BIOL 033 GN(3) or BIOL 222(3), BIOL 055 GN(3), BIOL 129(4), BIOL 141 GN(3), BIOL 230W GN(4), BIOL 341 GN(3), BIOL 406(3), BIOL 421(4), BIOL 427(3), BIOL 472(3); CHEM 012 GN(3), CHEM 013 GN(3), CHEM 014 GN(1), CHEM 015 GN(1), CHEM 034(3) (Sem: 2-8)

SUPPORTING COURSES (9 credits)
Select 6 credits in natural sciences/quantification from department list (Sem: 2-8)
Select 3 credits in social and behavioral sciences from department list (Sem: 2-8)

BUSINESS OPTION: 24 credits

ADDITIONAL COURSES (15 credits)
Select 15 credits from: ACCTG 211(4); B LOG 301(3); ECON 002 GS(3), ECON 004 GS(3); FIN 301(3); FINSV 400(3); MGMT 301(3), MGMT 341(3); MKTG 220(3), MKTG 221(3) or MKTG 301(3), MKTG 327(3) (Sem: 2-8)

SUPPORTING COURSES (9 credits)
Select 6 credits in natural sciences/quantification from department list (MATH 022 or MATH 110 recommended) (Sem: 2-8)
Select 3 credits in social and behavioral sciences from department list (Sem: 2-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

PSYCHOLOGY

Capital College

NOTE: The description of this major was changing at press time. See www.psu.edu/bulletins/bluebook.

The Psychology major emphasizes the scientific study of human behavior in areas such as cognition, development, learning, physiology, personality, and social processes. The curriculum is designed to provide students with the analytical and critical thinking skills necessary to be good consumers of scientific information. Experiential and applied courses allow students to develop their research and counseling skills.

The Psychology program prepares students for careers in local, state, and federal government, and human service, applied behavior, human resources, and related fields. The Psychology program also provides the background for graduate education at both the master's and the doctoral level.

The Psychology major offers two options. The option in Experimental Psychology is a traditional psychology program and provides a strong background for students who intend to pursue graduate study in any area of psychology. This option is strongly recommended for students who plan to undertake doctoral work. Students who want a traditional education in psychology but who do not plan on graduate study might also choose this option, in which case applied experience can be obtained by using elective credits to take internship and other applied courses. Assisting faculty members with their research is strongly encouraged for students who choose the Experimental Psychology option.

The option in Psychological Services provides training and experience in entry-level psychological services in order to facilitate the transition into the workforce following graduation. This option is recommended for students who do not intend to pursue doctoral work and who plan to work directly with people in the areas noted above. Students who choose the Psychological Services option can enhance their scientific and research expertise by using elective credits to take experimental psychology courses and by assisting faculty members with their research.

Both options are available to daytime students at the Harrisburg campus. Due to limited opportunities for evening internships, only the Experimental Psychology option is available to evening students at the Harrisburg campus. The Psychological Services option is available to students at the Schuylkill campus in a primarily daytime program.

For a B.S. degree in Psychology, a minimum of 122 credits is required.

ENTRY TO MAJOR REQUIREMENTS: Entry to the Psychology major requires a 2.00 cumulative grade-point average and an average of C (2.00) or better in any courses already taken in the major.

CHANGE-OF-ASSIGNMENT RECOMMENDATION: Students should request a change-of-assignment to Penn State Harrisburg or to Penn State Schuylkill during their fourth semester, to be effective for the next semester of enrollment.

GENERAL EDUCATION: 45 credits
(12 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education Course Requirements in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 15-21 credits

REQUIREMENTS FOR THE MAJOR: 68-74 credits
(This includes 12 credits of General Education courses: 3 credits of GWS courses; 3 credtis of GN courses; 6 credits of GQ courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 41 credits

PRESCRIBED COURSES (17 credits)[1]
BI SC 004 GN(3), ENGL 202A GWS(3), PSY 002 GS(3) (Sem: 1-4)
PSYC 350(4), PSYC 351W(4) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (24 credits)
Select 3 credits[1] from any GQ mathematics numbered MATH 021 or higher, except for MATH 035 (Sem: 1- 4)
Select 3 credits from any GQ mathematics, computer science, or philosophy (Sem: 1-4)
Select 6 credits of foreign language or courses from: AMSTD, C ART, C HIS, C MUS, ENLSH, HCOMM, HUM, LIT, THTRE, or PHILOS (Sem: 1-8)

Select 6 credits in social science: AFRAS, BESC, SCLSC, or SOCIO (Sem: 5-8)
Select 6 credits from CRIMJ or PUBPL (Sem: 5-8)

REQUIREMENTS FOR THE OPTION: 27-33 credits

EXPERIMENTAL PSYCHOLOGY OPTION: (27 credits)[1]

ADDITIONAL COURSES (27 credits)
Select 12 credits from: PSYC 300W(4), PSYC 310 GI(3), PSYC 365 GI(3), PSYC 395(1-18), PSYC 400(3), PSYC 402(3), PSYC 403(3), PSYC 405(3), PSYC 406(3), PSYC 409(3), PSYC 412(3), PSYC 415(3), PSYC 421(3), PSYC 424(3), PSYC 425(3), PSYC 427(3), PSYC 444 DF(3), PSYC 482(3), PSYC 492(3), PSYC 494(1-12), PSYC 496(1-18), 497(1-9) (Sem: 5-8)
Select 9 credits from: PSYC 402(3), PSYC 405(3), PSYC 415(3), PSYC 482(3) (Sem: 5-8)
Select 6 credits from: PSYC 424(3), PSYC 425(3), PSYC 427(3) (Sem: 5-8)

PSYCHOLOGICAL SERVICES OPTION: 33 credits[1]

PRESCRIBED COURSES (15 credits)
BE SC 459(3) (Sem: 5-7)
PSYC 415(3) (Sem: 5-8)
BE SC 461(3), PSYC 395(6) (Sem: 6-8)

ADDITIONAL COURSES (18 credits)
(At least 6 credits must be at the 400 level.)
Select 6 credits of individual difference courses from: PSY 213 GS(3); PSY 217 GS(3) or PSYC 402(3); PSY 238 GS(3) or PSYC 482(2) (Sem: 3-8)
Select 12 credits from: PSY 243(3), PSYC 300W(4), PSYC 310 GI(3), PSYC 365 GI(3), PSYC 403(3), PSYC 405(3), PSYC 406(3), PSYC 409(3), PSYC 421(3), PSYC 494(3), PSYC 497(3) (Sem: 3-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

PSYCHOLOGY, B.A.

Penn State Erie, The Behrend College

Psychology is both a scientific discipline and a profession. Its overall focus is the study of behavior, cognition, and affect, and their associated physiological processes. Research is vital to the discipline of psychology. Investigators collect, quantify, analyze, and interpret data in order to understand the principles and theories of human thought and behavior. As a profession, psychology involves the application of knowledge, skills, and techniques for the solution and prevention of individual and social problems. Bachelor-level graduates in psychology are equipped for various positions in human service agencies, industrial settings, and laboratories. However, many students continue their training, working towards a master's or a doctoral degree in psychology, while still others go on to school in other disciplines, e.g., medical school or law school.

Students may select either the Bachelor of Arts or Bachelor of Science program. The Bachelor of Arts degree requires more credits in the arts, humanities, and social sciences and proficiency in a second language. The Bachelor of Science program, in turn, offers two options. The General option is intended for students with a strong interest in science and requires more course work in the biological, physical, and mathematical sciences than does the Bachelor of Arts program. The Business option is designed for students who wish to combine their interests in business and psychology.

For the B.A. degree in Psychology, a minimum of 124 credits is required. Each student must earn at least a grade of C in each 300- and 400-level course in the major field.

GENERAL EDUCATION: 45 credits
(0-4 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 12-16 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 43 credits
(This includes 0-4 credits of General Education GQ courses.)

PRESCRIBED COURSES (12 credits)
CMPBD 100(1) (students may test out of this course) (Sem: 1-4)
PSY 002 GS(3)[1] (Sem: 1-4)
PSY 201W(4)[1] (Sem: 1-4)
PSYCH 431W(4) (Sem: 5-8)

ADDITIONAL COURSES (16 credits)
PSY 015(4)[1] or STAT 200 GQ(4)[1] (Sem: 1-4)
Select 12 credits, including one course from at least four of the following five categories:
1. Foundations of Behavior: PSY 203(3), PSY 204 GS(3), PSYCH 440(3), PSYCH 454(3), PSYCH 466(3) (Sem: 1-6)
2. Social/Developmental: PSY 213 GS(3), PSY 217 GS(3), PSYCH 427(3), PSYCH 433(3), PSYCH 434(3), PSYCH 446(3), PSYCH 455(3) (Sem: 1-6)
3. Cognitive/Experimental: PSY 202(3), PSY 220(3), PSY 221(3), PSYCH 428(3), PSYCH 429(3), PSYCH 433(3), PSYCH 442(3) (Sem: 1-6)
4. Clinical/Personality: PSY 238 GS(3), PSYCH 130(3), PSYCH 434(3), PSYCH 435(3), PSYCH 486(3), PSYCH 487(3) (Sem: 1-6)
5. Diversity: PSY 237 GS(3), PSY 270 GS;GI(3), PSYCH 120 GS;GI(3), PSYCH 472 DF(3) (Sem: 3-8)
Note: PSYCH 434 may be counted in either Social/Developmental or Clinical/Personality, but not both.

SUPPORTING COURSES AND RELATED AREAS (15 credits)
Select 6 additional credits of psychology courses at any level as interest dictates (3 credits of either PSYCH 495 or 496 may be applied to this requirement) (Sem: 3-8)
Select 9 credits of 400-level psychology courses from any combination of categories in consultation with adviser (Sem: 5-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

PSYCHOLOGY, B.S.

Penn State Erie, The Behrend College

Psychology is both a scientific discipline and a profession. Its overall focus is the study of behavior, cognition, and affect, and their associated physiological processes. Research is vital to the discipline of psychology. Investigators collect, quantify, analyze, and interpret data in order to understand the principles and theories of human thought and behavior. As a profession, psychology involves the application of knowledge, skills, and techniques for the solution and prevention of individual and social problems. Bachelor-level graduates in psychology are equipped for various positions in human service agencies, industrial settings, and laboratories. However, many students continue their training, working towards a master's or a doctoral degree in psychology, while still others go on to school in other disciplines, e.g., medical school or law school.

Students may select either the Bachelor of Arts or Bachelor of Science program. The Bachelor of Arts degree requires more credits in the arts, humanities, and social sciences and proficiency in a second language. The Bachelor of Science program, in turn, offers two options. The General option is intended for students with a strong interest in science and requires more course work in the biological, physical, and mathematical sciences than does the Bachelor of Arts program. The Business option is designed for students who wish to combine their interests in business and psychology.

For the B.S. degree in Psychology, a minimum of 124 credits is required. Each student must earn at least a grade of C in each 300- and 400-level course in the major field.

GENERAL EDUCATION: 45 credits
(4-8 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 15-19 credits

REQUIREMENTS FOR THE MAJOR: 68 credits
(This includes 4-8 credits of General Education GQ courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 47 credits

PRESCRIBED COURSES (12 credits)
CMPBD 100(1), PSY 002 GS(3)[1] (Sem: 1-4)
PSY 201W(4)[1] (Sem: 3-6)
PSYCH 431W(4) (Sem: 5-8)

ADDITIONAL COURSES (20 credits)
MATH 110 GQ(4) or MATH 140 GQ(4) (Sem: 1-2)
PSY 015(4)[1] or STAT 200 GQ(4)[1] (Sem: 1-4)
Select 12 credits, including one course from at least four of the following five categories:
1. Foundations of Behavior: PSY 203(3), PSY 204 GS(3), PSYCH 440(3), PSYCH 454(3), PSYCH 466 (3) (Sem: 3-8)
2. Social/Developmental: PSY 213 GS(3), PSY 217 GS(3), PSYCH 427(3), PSYCH 433(3), PSYCH 434(3), PSYCH 446(3), PSYCH 455(3) (Sem: 3-8)
3. Cognitive/Experimental: PSY 202 GS(3), PSY 221 GS(3), PSYCH 428(3), PSYCH 429(3), PSYCH 433(3), PSYCH 442(3) (Sem: 3-8)
4. Clinical/Personality: PSY 238 GS(3), PSYCH 130(3), PSYCH 434(3), PSYCH 435(3), PSYCH 486(3), PSYCH 487(3) (Sem: 3-8)
5. Diversity: PSY 237 GS(3), PSY 270 GS;GI(3), PSYCH 120 GS;GI(3), PSYCH 472 DF(3) (Sem: 3-8)
Note: PSYCH 434 may be counted in either Social/Developmental or Clinical/Personality, but not both.

SUPPORTING COURSES AND RELATED AREAS (15 credits)
Select 6 additional credits of psychology courses at any level as interest dictates (3 credits of either PSYCH 495 or PSYCH 496 may be applied to this requirement) (Sem: 3-8)
Select 9 credits of 400-level psychology courses from any combination of categories in consultation with adviser (Sem: 3-8)

REQUIREMENTS FOR THE OPTION: 21 credits

BUSINESS OPTION: 21 credits

SUPPORTING COURSES AND RELATED AREAS: 21 credits
Select 21 credits in business courses in consultation with adviser (Sem: 3-8)

GENERAL PSYCHOLOGY OPTION: 21 credits

SUPPORTING COURSES AND RELATED AREAS (21 credits)
Select 21 credits in science courses in consultation with adviser (Sem: 3-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

PSYCHOLOGY, B.A.

College of the Liberal Arts
This major is designed for students who want to learn about behavior, normal and abnormal, how it is studied, and its relation to applied areas. Students are encouraged to conduct research with members of the faculty and/or take a practicum in an applied setting. Graduates are equipped for various positions in human service agencies, industrial settings, or laboratories. Others go on to professional school, e.g., medical school, law school, or to continue their training in psychology working toward a master's or a doctoral degree. Majors may elect either a Bachelor of Arts or a Bachelor of Science program.

For the B.A. degree in Psychology, a minimum of 123 credits is required

GENERAL EDUCATION: 45 credits
(0-6 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 15 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 41 credits[1]
(This includes 6 credits of General Education GQ courses.)

PRESCRIBED COURSES (7 credits)
PSY 002 GS(3) (Sem: 1-4)
PSY 201W(4) (Sem: 3-6)

ADDITIONAL COURSES (34 credits)
Select 6 credits of GQ courses (Sem: 1-4)
PSY 015(4) or STAT 200 GQ(4) (Sem: 3-4)
Select 24 credits from groups a through h. You must take at least 3 credits from each of four different groups. At least 15 of the 24 credits must be 300- or 400-level courses.
a. Abnormal/Clinical/Personality: PSY 238 GS(3), PSY 243 GS(3), PSY 412(3), PSY 436(3), PSY 437(3), PSY 438(3), PSY 473(3), PSY 474(3), PSY 482(3), PSY 488(3), PSY 489(3) (Sem: 3-8)
b. Biological/Comparative/Perception/Physiological/Sensation: PSY 202 GS(3), PSY 203(3), PSY 209(3), PSY 402(3), PSY 405(3), PSY 407(3), PSY 408(3), PSY 456(3), PSY 483(3), PSY 484(3), PSY 485(3), PSY 487(3) (Sem: 3-8)
c. Cognitive/Learning/Psycholinguistics: PSY 204 GS(3), PSY 221 GS(3), PSY 404(3), PSY 420(3), PSY 421(3), PSY 422(3), PSY 430(3), PSY 444(3) (Sem: 3-8)
d. Developmental: PSY 213 GS(3), PSY 423(3), PSY 424(3), PSY 425(3), PSY 426(3), PSY 445(3) (Sem: 3-8)
e. Industrial/Engineering: PSY 231 GS(3), PSY 432(3), PSY 441(3), PSY 451(3), PSY 461(3) (Sem: 3-8)
f. History/Philosophy/Religion/Diversity: PSY 236 GS(3), PSY 237 GS(3), PSY 270 GS;GI(3), PSY 410(3), PSY 411(3), PSY 414(3), PSY 479(3) (Sem: 3-8)
g. Methods/Quantitative: PSY 301A-F(3 each), PSY 401(3), PSY 415(3), PSY 419(3), PSY 449(3), PSY 450(3) (Sem: 3-8)
h. Social: PSY 217 GS(3), PSY 417(3), PSY 443(3), PSY 470(3), PSY 471 GI(3), PSY 475(3), PSY 476(3), PSY 477(3) (Sem: 3-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

PSYCHOLOGY, B.S.

College of the Liberal Arts
This major is designed for students who want to learn about behavior, normal and abnormal, how it is studied, and its relation to applied areas. Students are encouraged to conduct research with members of the faculty and/or take a practicum in an applied setting. Graduates are equipped for various positions in human service agencies, industrial settings, or laboratories. Others go on to professional school, e.g., medical school, law school, or to continue their training in psychology working toward a master's or a doctoral degree. Majors may elect either a Bachelor of Arts or a Bachelor of Science program.

The B.S. degree program requires more course work in the sciences than the B.A. program, and students may select courses from one of four areas—mathematics/computer science, statistics, business, or biology—which may be taken instead of a foreign language.

For the B.S. degree in Psychology, a minimum of 126 credits is required.
GENERAL EDUCATION: 45 credits
(3-9 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 10-13 credits

REQUIREMENTS FOR THE MAJOR: 77-80 credits[1]
(This includes 9 credits of General Education courses: 3 credits of GWS courses and 6 credits of GQ courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 47 credits

PRESCRIBED COURSES (10 credits)
PSY 002 GS(3) (Sem: 1-4)
ENGL 202A GWS(3) (Sem: 3-4)
PSY 201W(4) (Sem: 3-6)

ADDITIONAL COURSES (37 credits)
Select 6 credits of GQ courses (Sem: 1-4)
PSY 015(4) or STAT 200 GQ(4) (Sem: 3-4)
Select 24 credits from groups a through h. You must take at least 3 credits from each of four different groups. At least 15 of the 24 credits must be 300- or 400-level courses.
a. Abnormal/Clinical/Personality: PSY 238 GS(3), PSY 243 GS(3), PSY 412(3), PSY 436(3), PSY 437(3), PSY 438(3), PSY 474(3), PSY 482(3), PSY 488(3), PSY 489(3) (Sem: 3-8)
b. Biological/Comparative/Perception/Physiological/Sensation: PSY 202 GS(3), PSY 203(3), PSY 209(3), PSY 402(3), PSY 405(3), PSY 407(3), PSY 408(3), PSY 456(3), PSY 473(3), PSY 483(3), PSY 484(3), PSY 485(3), PSY 487(3) (Sem: 3-8)

c. Cognitive/Learning/Psycholinguistics: PSY 204 GS(3), PSY 221 GS(3), PSY 404(3), PSY 420(3), PSY 421(3), PSY 422(3), PSY 430(3), PSY 444(3) (Sem: 3-8)
d. Developmental: PSY 213 GS(3), PSY 423(3), PSY 424(3), PSY 425(3), PSY 426(3), PSY 445(3) (Sem: 3-8)
e. Industrial/Engineering: PSY 231 GS(3), PSY 432(3), PSY 441(3), PSY 451(3), PSY 461(3) (Sem: 3-8)
f. History/Philosophy/Religion/Diversity: PSY 236 GS(3), PSY 237 GS(3), PSY 270 GS;GI(3), PSY 410(3), PSY 411(3), PSY 414(3), PSY 479(3) (Sem: 3-8)
g. Methods/Quantitative: PSY 301A-F(3 each), PSY 401(3), PSY 415(3), PSY 419(3), PSY 449(3), PSY 450(3) (Sem: 3-8)
h. Social: PSY 217 GS(3), PSY 417(3), PSY 443(3), PSY 470(3), PSY 471 GI(3), PSY 475(3), PSY 476(3), PSY 477(3) (Sem: 3-8)

SUPPORTING COURSES AND RELATED AREAS (3 credits)
Select 3 credits in social and behavioral sciences from department list (Sem: 1-8)

REQUIREMENTS FOR THE OPTION: 30-33 credits

BIOLOGICAL AND EVOLUTIONARY SCIENCE OPTION: 30 credits

ADDITIONAL COURSES (15 credits)
Select 15 credits from groups a through d, including at least 3 credits from each of three different groups:
a. Genetics: ANTH 460(3), ANTH 473(3), ANTH 473W(3); BIOL 033 GN(3) or BIOL 222(3) (Sem: 3-6)
b. Biological Anthropology: ANTH 021 GN(3), ANTH 401(3), ANTH 406W(3), ANTH 471(3), BB H 410(3) (Sem: 3-6)
c. Biobehavioral Implications: ANTH 464(3); BB H 101 GHA(3) or any higher-numbered BB H course, except BB H 310W(3); HD FS 417(3), HD FS 468(3) (Sem: 3-6)
d. Biology and Chemistry: BIOL 141 GN(3), BIOL 341 GN(3), BIOL 409(3), BIOL 421(4), BIOL 427(3), BIOL 472(3); CHEM 012 GN(3), CHEM 013 GN(3), CHEM 014 GN(1), CHEM 015 GN(1), CHEM 036(2), CHEM 038(3), CHEM 039(3) (Sem: 3-6)

SUPPORTING COURSES AND RELATED AREAS (15 credits)
Select 3 credits in arts/humanities from department list (Sem: 1-8)
Select 6 credits in natural sciences from department list (Sem: 1-8)
Select 6 credits in social and behavioral sciences from department list (Sem: 1-8)

BIOLOGICAL SCIENCES OPTION: 30-33 credits

ADDITIONAL COURSES (15-18 credits)
PSY 203(3) (also counts in category b of COMMON REQUIREMENTS FOR THE MAJOR) (Sem: 3-6)
Select 3 credits each from groups a through e:
a. Genetics: BIOL 033 GN(3), BIOL 110 GN(4), or BIOL 222(3) (Sem: 3-6)
b. Physiology: BIOL 141 GN(3) or BIOL 472(3) (Sem: 3-6)
c. Organic Chemistry: CHEM 034(3), CHEM 038(3), or CHEM 039(3) (Sem: 3-6)
d. Cell Biology: BIOL 230W GN(4), BIOL 469(3), MICRB 106 GN(3), MICRB 201(3), MICRB 251(3) (Sem: 3-6)
e. Other Topics: BIOL 240W GN(4), BIOL 341 GN(3), BIOL 409(3), BB H 470(3) (Sem: 3-6)

NOTE: Students planning to apply to medical school should select this option and choose courses to meet the following minimal requirements for most medical schools: BIOL 110 GN(4), BIOL 230W GN(4), and BIOL 240W GN(4); CHEM 012 GN(3), CHEM 013 GN(3), CHEM 014 GN(1), CHEM 015 GN(1), CHEM 036(2), CHEM 038(3), and CHEM 039(3); PHYS 201 GN(4) and PHYS 202 GN(4), or PHYS 250 GN(4) and PHYS 251 GN(4).

SUPPORTING COURSES AND RELATED AREAS (15 credits)
Select 3 credits in arts/humanities from department list (Sem: 1-8)
Select 9 credits in natural sciences from department list (Sem: 1-8)
Select 3 credits in social and behavioral sciences from department list (Sem: 1-8)

BUSINESS OPTION: 30 credits

ADDITIONAL COURSES (15 credits)
Select 15 credits from groups a through e, including at least 3 credits from each of four different groups:
a. ECON 002 GS(3), ECON 004 GS(3), FIN 100(3), FIN 301(3), or any FIN course numbered higher than FIN 301; ECON 302 GS(3) or higher-numbered economics course (Sem: 3-6)
b. MGMT 100(3) or any course numbered MGMT 301(3) or higher (Sem: 3-6)
c. MKTG 221(3) or any course numbered MKTG 301(3) or higher (Sem: 3-6)

d. B LAW 243(3), B LOG 301(3) (Sem: 3-6)
e. ACCTG 211(4) (Sem: 3-6)

SUPPORTING COURSES AND RELATED AREAS (15 credits)
Select 6 credits in arts/humanities from department list (Sem: 1-8)
Select 3 credits in natural sciences from department list (Sem: 1-8)
Select 6 credits in social and behavioral sciences from department list (Sem: 1-8)

QUANTITATIVE SKILLS OPTION: 30 credits

ADDITIONAL COURSES (15 credits)
Select a total of 15 credits from groups a through d:
a. Select at least 3 credits from MATH 018 GQ(3), MATH 110 GQ(4), MATH 111 GQ(2), MATH 140 GQ(4), MATH 141 GQ(4) (Sem: 3-6)
b. (Optional) Select 3 credits from CMPSC 101 GQ(3), CMPSC 201C GQ(3), CMPSC 201F GQ(3), CMPSC 203 GQ(4), CSE 103 GQ(4) (NOTE: Students may take only one of the courses in category b for credit.) (Sem: 3-6)
c.1. Select 3 credits from STAT 318(3), STAT 414(3), STAT 418(3) (NOTE: Students may take only one of the courses in category c.1. for credit.) (Sem: 5-6)
c.2. Select at least 3 credits from STAT 319(3), STAT 415(3), STAT 416(3), STAT 460(3), STAT 462(3), STAT 464(3) (Sem: 5-6)
d. CAS 483(3), CSE 120(3), PSY 449(3), PSY 450(3) (Sem: 3-6)

NOTE: Students may fulfill the requirements of the Quantitative Skills Option by completing a minor in either Statistics or Computer Science and Engineering in lieu of the course requirements listed above. Students choosing this option are encouraged to consult with an adviser designated by the Department of Psychology to determine the suitability of particular courses given their quantitative backgrounds. Other courses with advanced quantitative content may be substituted in category d. with adviser's approval.

SUPPORTING COURSES AND RELATED AREAS (15 credits)
Select 6 credits in arts/humanities from department list (Sem: 1-8)
Select 9 credits in natural sciences from department list (Sem: 1-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

PSYCHOLOGY, APPLIED

See Applied Psychology

PUBLIC POLICY

Capital College

The Public Policy major is designed for students interested in policy issues, politics, public administration, and related areas like policy analysis and policy advocacy. The program prepares students for careers and graduate study in the fields of law, public administration, criminal justice, public policy, political science, and health care administration. Building on the program core, students may choose electives from a broad array of courses in public policy and other areas. While students can tailor an academic program to suit their needs, electives fit into categories like Public Management: Theory and Practice; American Politics: Process and Management; Law and Justice: The Legal System; and World Politics: National Security, International Relations, Comparative Politics. Students may wish, but are not required, to pursue one of these concentrations.

Our location near the state capital of Harrisburg provides students with exceptional opportunities for both study and internships. In addition to our full-time faculty, we draw on part-time faculty with particular professional strengths; in recent years this has included a state senator, a former lieutenant governor, a correction system administrator, and a governor's press secretary. The integration of academic study with the "real world" of Pennsylvania politics and policy making is further enhanced by our high-quality internship program that places qualified students in the state government's executive and legislative branches, as well as with government-related businesses and nonprofit organizations. This allows students to develop their professional skills, integrate classroom learning with workplace experiences, and enhance opportunities for professional employment following graduation.

For a B.S. degree in Public Policy, a minimum of 120 credits is required.

ENTRY TO MAJOR REQUIREMENTS: Entry to the Public Policy major requires a 2.00 or higher cumulative grade-point average and an average of C (2.00) or better in any course already taken in the major.

CHANGE-OF-ASSIGNMENT RECOMMENDATION: Students should generally have completed most of their General Education requirements. A limited number of 001-200 level courses are offered at Penn State Harrisburg for students who need lower-division courses.

Students should request a change-of-assignment to Penn State Harrisburg during their fourth semester, to be effective for the next semester of enrollment.

GENERAL EDUCATION: 45 credits
(0-7 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 11-21 credits

REQUIREMENTS FOR THE MAJOR: 61-64 credits
(This includes 0-7 credits of General Education courses: 0-4 credits of GQ courses; 0-3 credits of GS courses.)
(At least 15 credits of 400-level courses must be taken from additional and/or supporting courses.)

PRESCRIBED COURSES (3 credits)
PL SC 470W(3) (Sem: 7-8)

ADDITIONAL COURSES (16-19 credits)
Select 3-6 credits[1] from the following: ECON 002 GS(3) and ECON 004(3), or select PUBPL 350(3) (Sem: 1-8)
Select 3 credits[1] from the following: PL SC 001 GS(3) or PUBPL 301(3) (Sem: 1-8)
Select 3 credits[1] from the following: PL SC 002(3) or PUBPL 304(3) (Sem: 1-8)
Select 4 credits[1] from the following: STAT 200 GQ(4) or SCLSC 320(4)(Sem: 1-8)
Select 3 credits[1] from the following: PUBPL 480(3) PUBPL 481(3), PUBPL 482(3), PUBPL 483(3), PUBPL 484(3), PUBPL 485(3) or PUBPL 490(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (42 credits)
Select 15 credits from the following: PUBPL, CRIMJ, HCM, INT U, PL SC (Sem: 1-8)
Select 6 credits from the following: AFRAS 300-499(3), BE SC 300-499(3), PSYC 300-499(3), SOCIO 300-499(3) (Sem: 5-8)
Select 6 credits from the following: AMSTD 300-499(3), C ART 300-499(3), C HIS 300-499(3), C MUS 300-499(3), COMCL 300-499(3), ENGL 300-499(3), ENLSH 402(3), ENLSH 407(3), HUM 300-499(3), PHLOS 300-499(3), RL ST 300-499(3) (Sem: 5-8)
Select 15 credits in consultation with an academic adviser and in support of the student's interests. (Sem: 5-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

RECREATION AND PARK MANAGEMENT

College of Health and Human Development

Through this program, students can prepare for positions in recreation/leisure services. It provides the basis for supervisory and administrative positions for federal, state, and local leisure service agencies such as hospitals, park systems, and environmental centers, as well as commercial recreation and tourism agencies, university student unions and/or intramural programs, nursing homes, churches, private voluntary agencies, armed services, and any other delivery system providing recreation services. Four options are offered: (1) Commercial and Community Recreation Management, (2) Golf Management, (3) Park Management and Environmental Interpretation, and (4) Therapeutic Recreation.

Students who have completed 28 credits with a 2.00 cumulative grade-point average are eligible for entrance into the major after filing a written application. Freshman students are admitted directly into the Golf Management option at the University Park campus only. In addition to the University's academic requirements, each student admitted to the Golf Management option must have a playing proficiency represented by a minimum golf handicap of eight or lower. This must be certified in writing by a PGA member or golf coach.

For the B.S. degree in Recreation and Park Management, a minimum of 124 credits is required for the Commercial and Community Recreation Management, Park Management and Environmental Interpretation, and Therapeutic Recreation options. For the Golf Management option, a minimum of 126 credits is required for the B.S. degree in Recreation and Park Management. (To satisfy graduation requirements, students must have completed 6 credits from courses offered in the college and outside the department in which the major is offered.)

COMMERCIAL AND COMMUNITY RECREATION MANAGEMENT OPTION: This option focuses on management in the private/commercial, non-profit, and public sectors of recreation/leisure services. The private/commercial focus will be of interest to students seeking careers in a variety of commercial settings such as resorts; theme parks, convention centers; sports and fitness facilities, including arenas and stadiums; tourism promotion/planning agencies; and employee recreation departments within corporations. This focus will also appeal to students wishing to become entrepreneurs. For those interested in the community, public, or nonprofit sectors, this option prepares students for positions within municipal, state, and federal government agencies; recreation divisions of the armed services; YMCA agencies; United Way agencies; scouting organizations;

university-affiliated units such as student unions, intramural and alumni services; and other nonprofit organizations.

GOLF MANAGEMENT OPTION: This option helps prepare students to manage golf facilities within the municipal, military, public, and private sectors. In addition to the core curriculum in Recreation and Park Management, this option includes a strong basic education in business coupled with course work in turf management and hospitality. Each student completes sixteen months of Co-op education under the supervision of a Class A member of the Professional Golfers' Association of America.

PARK MANAGEMENT AND ENVIRONMENTAL INTERPRETATION OPTION: This option helps prepare students for program-related careers in environmental interpretation or management-related careers in recreation and parks. One track focuses upon natural and cultural history interpretation, including environmental education. Another track emphasizes outdoor recreation and adventure programming. These two tracks would be of interest to students seeking positions with federal, state, and local governments, as well as the non-profit and private sectors. The third track focuses on the management of facilities and resources in recreation and parks. It would be of interest to students seeking employment in facility and resource management with public recreation and park agencies (local, state, and federal levels), camps, and commercial facilities.

THERAPEUTIC RECREATION OPTION: This option helps prepare individuals to provide comprehensive therapeutic recreation services. These services are intended to facilitate the development of a satisfying leisure lifestyle for individuals of all ages experiencing limitations through disability, illness, or restricted social conditions. It will be of interest to students seeking employment in health and human service agencies, including rehabilitation centers, hospitals, and a variety of treatment, residential, and community-based facilities.

GENERAL EDUCATION: 45 credits
(3-7 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 11-17 credits

REQUIREMENTS FOR THE MAJOR: 68-75 credits
(This includes 3-7 credits of General Education courses: 3-4 credits of GQ courses; 0-3 credits of GN courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 27-28 credits

PRESCRIBED COURSES (24 credits)[1]
R P M 101(2), R P M 120(3), R P M 201(1), R P M 236(3) (Sem: 1-4)
R P M 277 GI(3), R P M 356(3) (Sem: 3-6)
R P M 460(3), R P M 465(3) (Sem: 5-8)
R P M 433W(3) (Sem: 7-8)

ADDITIONAL COURSES (3-4 credits)
EDPSY 101 GQ(3), STAT 100 GQ(3), or STAT 200 GQ(4) (Sem: 3-6)

REQUIREMENTS FOR THE OPTION: 41-47 credits

COMMERCIAL AND COMMUNITY RECREATION MANAGEMENT OPTION: 42-43 credits

PRESCRIBED COURSES (24 credits)[1]
R P M 210(2), R P M 300W(3), R P M 394(1) (Sem: 3-6)
R P M 410(3), R P M 415(3), R P M 495A(12) (Sem: 5-8)

ADDITIONAL COURSES (6-7 credits)
Select 6-7 credits from:
ACCTG 211(4) or HRIM 335(3) (Sem: 3-4)
B LAW 243(3), HRIM 318(2), HRIM 443(3), MKTG 220(3) (Sem: 5-6)
MGMT 341(3) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 12 credits (at least 3 at the 400 level) from department list in consultation with faculty adviser (Sem: 3-8)

GOLF MANAGEMENT OPTION: 46-47 credits

PRESCRIBED COURSES (43 credits)
B A 250(3), B LAW 243(3), R P M 295A(1)[1] (Sem: 3-6)

HRIM 336(3), MKTG 220(3), R P M 360(3)[1], R P M 395B(2)[1] (Sem: 5-6)
HRIM 318(2), R P M 410(3)[1], R P M 470(3)[1], R P M 495B(3)[1], TURF 235(3) (Sem: 5-10)
HRIM 466(3), R P M 495C(4)[1], R P M 495D(4)[1] (Sem: 9-10)

ADDITIONAL COURSES (3-4 credits)
ACCTG 211(4) or HRIM 335(3) (Sem: 3-6)

PARK MANAGEMENT AND ENVIRONMENTAL INTERPRETATION OPTION: 41-42 credits

PRESCRIBED COURSES (17 credits)[1]
R P M 320(3), R P M 394(1) (Sem: 3-4)
R P M 480(1), R P M 495A(12) (Sem: 5-8)

ADDITIONAL COURSES (21-22 credits)
Select 6 credits from courses with the following abbreviations: E R M, FOR, GEOSC, W F S (Sem: 3-6)
Select among: a, b, or c (15-16)
a. Select 15 credits from R P M 325(3)[1], R P M 326(3)[1], R P M 327(3)[1], R P M 425(3)[1], R P M 430(3)[1] (Sem: 3-8)
b. Select 9 credits from R P M 325(3)[1], R P M 330(3)[1], R P M 334(3)[1], R P M 430(3)[1], R P M 440(3)[1] (Sem: 3-8)
Select 6 credits from department list in consultation with faculty adviser (Sem: 3-8)
c. Select 9-10 credits from ACCTG 211(4) or HRIM 335(3), MGMT 100(3), MGMT 341(3), MKTG 221(3) or R P M 410(3)[1], R P M 334(3) [1] (Sem: 3-6)
Select 6 credits from R P M 435(3)[1], R P M 470(3)[1] (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (3 credits)
Select 3 credits at the 400 level from department list, in consultation with faculty adviser (Sem: 3-8)

THERAPEUTIC RECREATION OPTION: 41 credits

PRESCRIBED COURSES (32 credits)
BI SC 004 GN(3), R P M 386(3)[1], R P M 394(1)[1] (Sem: 5-6)
REHAB 409(3), R P M 476(3)[1], R P M 486(3)[1], R P M 487(1)[1], PSY 412(3) (Sem: 5-8)
R P M 495A(12)[1] (Sem: 7-8)

ADDITIONAL COURSES (3 credits)
Select 3 credits from HD FS 129 GS(3), HD FS 229 GS(3), HD FS 239 GS(3), HD FS 249 GS(3) (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits from department list, in consultation with adviser (Sem: 3-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

REHABILITATION SERVICES

College of Education

This major helps prepare students for entry-level positions in a variety of human service settings, especially persons with physical, emotional, or mental disabilities. Students enter employment in a variety of settings including rehabilitation centers, sheltered workshops, drug and alcohol programs, senior citizens centers, community mental health and mental retardation programs, corrections systems, and hospitals. Increasing opportunities are available in private for-profit insurance programs for the industrially injured, and in rapidly emerging employee assistance programs within business and industry. Well-planned use of electives and internships allows for specialization. The full-semester (15-credit) internship is provided under the supervision of field counselors in human service agencies across Pennsylvania. These intensive "hands-on" experiences are frequently avenues for entry jobs since the internship is completed during the senior year. Students may not go on internship until they have successfully completed all other course work. Students are encouraged to participate in volunteer activities and courses providing an opportunity for work with people with disabilities; this gives greater meaning to related course work. All students are encouraged to declare a minor in a related area. These choices must be discussed thoroughly with the student's adviser. The program also helps prepare students for graduate study in many human service professional disciplines.

For the B.S. degree in Rehabilitation Services, a minimum of 124 credits is required.

GENERAL EDUCATION: 45 credits
(18-19 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)

INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 20-23 credits

REQUIREMENTS FOR THE MAJOR: 75-77 credits
(This includes 18-19 credits of General Education courses: 6 credits of GS courses; 3-4 credits of GQ courses; 9 credits of GN courses.)

PRESCRIBED COURSES (45 credits)
PSY 002 GS(3), EDPSY 014(3) (Sem: 1-4)
SOC 001 GS(3), SOC 005 GS(3) (Sem: 1-6)
BIOL 141 GN(3) (Sem: 5-6)
CN ED 403(3)[1], REHAB 408(3)[1], REHAB 409(3)[1], REHAB 412(3)[1], REHAB 413W(3)[1], REHAB 495A(15) (Sem: 5-8)

ADDITIONAL COURSES (30-32 credits)
PSY 213 GS(3), HD FS 239 GS(3), or EDPSY 010(3) (Sem: 1-2)
Select 3-4 credits from BI SC 001 GN(3), BI SC 002 GN(3), BI SC 003 GN(3), BI SC 004 GN(3), or BIOL 110 GN(4) (Sem: 3-4)
ANTH 021 GN(3) or BIOL 033 GN(3) (Sem: 3-4)
EDTHP 115(3) or other EDTHP selection(3) (Sem: 3-4)
EDPSY 101 GQ(3) or STAT 200 GQ(4) (Sem: 3-6)
Select 9 credits from ADMJ, BB H, HD FS, KINES, PSY, or SOC (Sem: 3-8)
PSY 412(3) or PSY 437(3) (Sem: 5-8)
REHAB 425(3)[1] or EDPSY 450(3) (Sem: 7-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

RELIGIOUS STUDIES

College of the Liberal Arts
This major explores religious outlooks, institutions, and practices, and studies the relationship of these to other aspects of culture. The program includes courses in major religious traditions and uses the scholarly methods of the humanities and social sciences to study the human religious condition.

For the B.A. degree in Religious Studies, a minimum of 124 credits is required.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 25 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 30 credits[1]

ADDITIONAL COURSES (18 credits)
Select 3 credits from RL ST 001-099 (Sem: 1-6)
Select 9 credits from RL ST 100-299 (Sem: 3-8)
Select 6 credits from RL ST 401-499 (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
(Include at least 6 credits at the 400 level.)

Select 12 credits from:
ANTH 045 GS;DF(3), ART H 120 GA;GI(3), ART H 212 GA(3), ART H 442(3), CAMS 045 GH;DF(3), CMLIT 003 GH;GI(3), CMLIT 004 GH;GI(3), CMLIT 108 GH;GI(3), CMLIT 120 GH(3), CMLIT 141 GH;GI(3), CMLIT 408(3), ENGL 104 GH(3), HEBR 010 GH;GI(3), HIST 102 GH;DF(3), HIST 105 GH(3), HIST 108 GH(3), HIST 172 GI(3), HIST 174 GH;GI(3), HIST 181 GH;GI(3), HIST 191 GH;GI(3), HIST 405W(3), HIST 408(3), HIST 412(3), HIST 414(3), HIST 459W(3), HIST 471W(3), HIST 480(3), HIST

483(3), HIST 484W(3), PHIL 007 GH;DF(3), PHIL 124 GH(3), PHIL 201 GH(3), PHIL 424(3), PHIL 435(3), PHIL 454(3), PSY 236 GS(3), PSY 237 GS(3), PSY 414(3), PSY 479(3), RL ST 401 DF(3), RL ST 402(3), RL ST 408 GI(3), RL ST 409 DF(3), RL ST 411 DF(3), RL ST 420(3), RL ST 422(3), RL ST 430(3), RL ST 440W(3), RL ST 461(3), RL ST 479(3), RL ST 481 DF(3), RL ST 483 DF(3), RL ST 494(1-12), RL ST 496(1-18), RL ST 497(1-9), SOC 461(3), THEA 401W(3) or THEA 406 DF(3) (Sem: 1-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

RESERVE OFFICERS' TRAINING CORPS

AIR FORCE AEROSPACE STUDIES

The Air Force ROTC program trains qualified young men and women for service as commissioned officers in the United States Air Force.

The program is offered at the University Park campus and by special arrangement as follows: students attending Penn State Worthington Scranton, Penn State Hazleton, or Penn State Wilkes-Barre may complete freshman and sophomore requirements at Wilkes College, Wilkes-Barre, Pa.; students attending Penn State Abington or Penn State Delaware County may complete freshman and sophomore requirements at St. Joseph's University, Philadelphia, Pa.; students attending Penn State Altoona may complete freshman and sophomore requirements at the University Park campus. The junior and senior requirements may then be completed upon relocation to University Park campus.

Four-, three-, two-, and one-year (limited) scholarships are available to selected applicants. These scholarships provide $250–400 per month along with full tuition and textbook allowance. Also, all cadets in the junior and senior courses are paid at the rate of $350–400 per month (tax free), resepectively, even if not on scholarship. Uniforms and ROTC textbooks are provided for free by the Air Force.

COURSE—The instruction consists of a General Military Course (freshmen and sophomores) and a Professional Officer Course (juniors and seniors) of four semesters each. Subjects and credits appear under course descriptions (ROTC) in this bulletin. Students have an opportunity to visit Air Force bases throughout the school year and summer months, where they may receive instruction on parachuting, flying gliders, and other Air Force-related activities.

Completion of eight semesters and one four-week summer training period confers eligibility for a commission in the Air Force Reserve and assignment to active duty in the USAF with the rank of second lieutenant. For students graduating in fewer than four years, there is also a two-year program in which a six-week summer training period replaces both the General Military Course and the normal four-week summer training period. Those students not participating in the four-year program but who will have four or more full academic semesters available, either undergraduate or graduate, after completion of the six-week summer training period are eligible for this two-year program, which leads to an Air Force commission.

MILITARY SCIENCE

The Army Reserve Officers' Training Corps (Army ROTC) is an elective program of instruction and training that offers qualified students the opportunity to earn a commission as an officer (Second Lieutenant) and to serve in the United States Army, Army National Guard, or United States Army Reserve while working toward a baccalaureate degree as a full-time student. The program emphasizes student learning and participation in applied leadership, leadership theory, decision making, management skills, time management, and military knowledge and skills. The four-year program is conducted in two successive phases—the Basic Course and Advanced Course (20 total credits). At least 6 Army ROTC credits may be applied toward baccalaureate degree requirements in all majors, usually as elective credits. Course subjects and credits appear under ROTC course descriptions in this bulletin.

The Basic Course is a four-course series, usually taken in the freshman and sophomore years. Freshman and sophomore courses are 2 credits each. The Basic Course trains the student in a variety of topics, including the national defense structure, leadership theory and principles, land navigation, small-unit operations and tactics, military history, and basic military skills and knowledge. The student incurs no military service obligation while enrolled in the Basic Course, and may dis-enroll at any time (except for sophomores on Army ROTC scholarships). Enrollment in the Basic Course is open to all Penn State full-time students. Also, uniforms, textbooks, and most equipment are furnished at no charge by the government to all enrolled students.

The Army ROTC program is much more than just taking classes. Each semester, the Army ROTC program consists of five activity segments: classroom lectures (one or two fifty-minute classes per week), a 100-minute Leadership Laboratory, Physical Training sessions, day trips and field training exercises, and extracurricular activities that include numerous clubs and social events. While the latter three activities are generally optional for enrolled Basic Course students, most students become progressively involved to enhance their training, develop esprit de corps, and take part for the social and fun aspects of the program.

The Advanced Course consists of a series of four courses, each for 3 credits. The Advanced Course instructs and evaluates in such areas as leadership and management, tactical operations, strategy, personnel administration, logistics, military justice, and ethics. Advanced Course students incur a service obligation when contracted, after which they receive a cash stipend of up to $400 per month (tax free) up to $4,000 per academic year. Normally, in the summer between the junior and senior years, students attend a five- to six-week National Advanced Leader's Course, for which salary and travel expenses are paid for the student. National Advanced Leader's Course is a critical hurdle that students must pass to receive a commission. In addition, students must

complete at least one University course in each of five areas prior to commissioning: written communications, human behavior, computer literacy, mathematical reasoning, and American military history. These courses may also fulfill the student's General Education or academic major curriculum requirements.

Students may enter Army ROTC during their baccalaureate studies up until the start of their junior year via several lateral entry methods. These methods include compressing the Basic Course into one year (for sophomores), attending a four-week summer training program called Army ROTC Leader's Training Course, or by receiving constructive credit for prior military service. Entry after this time is possible only when an enrolling student will be continuing his/her education after baccalaureate graduation. Contracted students who wish to continue their education at a graduate level may request an education delay before starting their service obligation.

Three-year Army ROTC scholarships are available to students on a competitive basis. These merit scholarships pay full tuition, a book allowance ($600 per year), and a tax-free subsistence stipend of up to $400 per month up to $4,000 per academic year. Four-year scholarships are available only through competition in the high school senior year. Army ROTC scholarships are awarded in five major categories: engineering, analytic/physical sciences, nursing, technical/management, and generalists (all other majors except theology). In particular, Army ROTC has a strong program for Nursing majors with numerous scholarship and enrollment options.

Penn State Army ROTC is one of the largest and most successful ROTC programs in the United States. Army ROTC is offered at the following campuses: Abington, Altoona, Hazleton, and University Park. However, only the University Park campus offers the complete four-year program within the Penn State Army ROTC system. Army ROTC is also available at most other campuses through cross-enrollment agreements with other colleges and universities. For additional information on Army ROTC, see the enrollment officer at 212 Wagner Building on the University Park campus or call 814-863-0368 (toll free: 1-866-558-3513) or visit us at **www.psu.edu/dept/armyrotc** on the Web.

NAVAL SCIENCE

The Naval ROTC trains qualified young men and women at the University Park campus for service as commissioned officers in the Navy, the Navy Nurse Corps, or the Marine Corps.

Entering freshmen may be accepted into the Naval ROTC through the Four-Year College Program or in the Four-Year Scholarship Program. Freshmen who are not on scholarship may join NROTC and be eligible to compete for the Scholarship Program. Qualified sophomores either in attendance or planning to commence studies at University Park Campus with their junior year, or who have applied for transfer to Penn State from another institution, may compete for the special Two-Year College Program and the Two-Year Scholarship Program. Navy, Nurse, and Marine Corps scholarships provide full tuition, book allotment, laboratory and instructional fees, and a $250–350 per month subsistence allowance. In addition, Nurse scholarship students are issued special equipment required by the BSN curriculum.

Students who receive the baccalaureate degree and complete the NROTC program receive commissions as ensigns or second lieutenants. College Program commissionees are required to serve at least three years of active duty. Scholarship Program commissionees are committed to four years of active duty.

COURSES—All students must complete at least 18 credits of Naval Science (NAVSC) courses; subjects and credits appear under course descriptions (ROTC/NAVSC) later in this bulletin. College Program students must participate in one active duty training period (cruise) during the summer between junior and senior years. Scholarship students are required to participate in either two (Nurse) or three (Navy and Marine Corps) summer cruises prior to commissioning.

In addition, all Navy scholarship students must complete University courses in calculus, physics, national security policy, and American military affairs. Requirements for Nurse and Marine Corps scholarship students are somewhat less. College Program students must complete University courses in national security policy and American military affairs.

RUSSIAN

College of the Liberal Arts

The B.A. in Russian provides the student with a command of spoken and written Russian and a general knowledge of the literature and culture of the Russian people. No previous study of Russian is required for admission to the major. Study in Russia under the University's Education Abroad Program is available for qualified students. Students are advised to combine their study of Russian with another foreign language, English, history, political science, the Russian Area Studies minor, the Business/Liberal Arts minor, or the Linguistics minor. Graduates of this program have found employment in international business, the U.S. government, the educational and publishing fields, and the travel industry.

For the B.A. degree in Russian, a minimum of 124 credits is required.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)

WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 29 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 26 credits[1]

PRESCRIBED COURSE (17 credits)
RUS 204(4) (Sem: 1-4)
RUS 214(4) (Sem: 5-6)
RUS 304(3) (Sem: 3-6)
RUS 305(3) (Sem: 5-6)
RUS 400(3) (Sem: 5-8)

ADDITIONAL COURSES (9 credits)
Select 3 credits from RUS 141W(3) or RUS 142W(3) (Sem: 5-8)
Select 3 credits from RUS 450(3) or RUS 460(3) (Sem: 7-8)
Select 3 credits from RUS 426(3), RUS 427(3), or RUS 497(3) (Sem: 7-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

RUSSIAN TRANSLATION

College of the Liberal Arts
This major is designed to offer, within the context of a liberal education, specialized skills in translation from the Russian language. The curriculum is career oriented and requires competence in a field or fields in addition to the language skill. Students will select such a field or fields in accordance with their special interests and in consultation both with the adviser and with persons directly involved with the field chosen.

For the B.S. degree in Russian Translation, a minimum of 124 credits is required.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
ELECTIVES: 20 credits

REQUIREMENTS FOR THE MAJOR: 59-71 credits[1]

PRESCRIBED COURSES (17 credits)
RUS 204(4), RUS 214(4), RUS 304(3), RUS 400(3), RUS 412(3) (Sem: 3-8)

ADDITIONAL COURSES (18 credits)
Select 3 credits from each category:
a. ENGL 415(3), ENGL 416(3), ENGL 417(3), ENGL 418(3), ENGL 419(3), ENGL 421(3), or CMLIT 410(3) (Sem: 5-8)
b. HIST 141 GH(3), HIST 433(3), or HIST 434(3) (Sem: 3-8)
c. RUS 100 GH;GI(3), RUS 110 GH;GI(3), RUS 120 GH;GI(3), RUS 141W(3), or RUS 142W(3) (Sem: 5-8)
d. PL SC 413(3) or PL SC 414(3) (Sem: 7-8)
e. RUS 426(3) or RUS 427(3) (Sem: 7-8)
f. RUS 450(3) or RUS 460(3) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (24-36 credits)
Proficiency in Russian must be demonstrated by either course work or examination equivalent to the completion of 12 credits of course work (0-12) (Sem: 3-6)
Select a minimum of 24 credits in a field (or fields) in which the student plans to specialize as a translator (Sem: 3-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

SCIENCE, B.A.

Eberly College of Science

The Science major is an interdisciplinary degree that aims to provide a broad, general education in science. The bachelor of arts (B.A.) curriculum is designed specifically for students who have education goals relating to scientific theory and practice and who require a high degree of flexibility to obtain their educational objectives. After completing foundation courses in calculus, chemistry, physics, and the life sciences, students will select additional science courses from designated areas. A large number of supporting credits permit students to readily include the B.A. requirement and significant breadth or specialization into their undergraduate curriculum. Some examples include minors in business, computer and information science, education, kinesiology, or other fields. The degree allows students to become familiar with both the theory and the practice of science. It can help prepare students for various careers in pharmaceutical, biotechnical, chemical, medical, and agricultural industries. The degree can also be tailored to meet the specific requirements of professional programs such as medical, dental, or pharmacy schools.

In order to be eligible for entrance to the Science major, a student must have: 1) attained at least a 2.00 cumulative grade-point average; 2) completed MATH 140 GQ(4) with a grade of C or better; and 3) completed at least two of the following courses, BIOL 110 GN(4); CHEM 012 GN(3); PHYS 211 GN(4) or PHYS 250 GN(4), with a grade of C or better.

TWO-YEAR PREPROFESSIONAL PREPARATION: The first two years of the Science major (62 credits) can meet the preprofessional needs of those interested in admission to some schools of pharmacy, physical therapy, optometry, nursing, and physician assistant training. Successful students can then transfer after two years of undergraduate study to the professional school to which they are admitted. Note, however, that no Penn State degree can be awarded after only two years (62 credits) of study in the Science major. Also, note that the abbreviated two-year curriculum alone does not prepare students for admission to professional schools of general medicine, veterinary medicine, or dental medicine. Consult with the Eberly College of Science health sciences professional adviser for additional information.

For the B.A. degree in Science, a minimum of 124 credits is required, with at least 15 credits at the 400 level.

GENERAL EDUCATION: 45 credits
(15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in BACHELOR OF ARTS DEGREE REQUIREMENTS, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in BACHELOR OF ARTS DEGREE REQUIREMENTS, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in BACHELOR OF ARTS DEGREE REQUIREMENTS, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)

BACHELOR OF ARTS DEGREE REQUIREMENTS: 16-24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 70-78 credits
(This includes 15 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses.)

PRESCRIBED COURSES (20 credits)
CHEM 012 GN(3)[1], CHEM 013 GN(3), CHEM 014 GN(1), CHEM 015 GN(1), MATH 140 GQ(4)[1], MATH 141 GQ(4) (Sem: 1-2)
BIOL 110 GN(4)[1] (Sem: 1-4)

ADDITIONAL COURSES (17-23 credits)
PHYS 211 GN(4)[1], PHYS 212 GN(4), PHYS 213 GN(2), PHYS 214 GN(2); or PHYS 250 GN(4)[1], PHYS 251 GN(4) (Sem: 3-6)
Select 3-4 credits from CMPSC 101 GQ(3), MATH 250(3), or STAT 200 GQ(4) (Sem: 3-6)
Select 3-4 credits from B M B 211(3), BIOL 220W GN(4), BIOL 230W GN(4), BIOL 240W GN(4), or MICRB 201(3) (Sem: 3-6)
Select 3 credits from PHIL 110 GH(3), PHIL 221 GH(3), S T S 100 GH(3), or S T S 200 GS(3) (Sem: 3-8)

SUPPORTING COURSES AND RELATED AREAS (27-41 credits)
(A maximum of 12 credits of Independent Study (296, 496) may be applied toward credits for graduation.)
Select 15 credits in life, mathematical, or physical sciences, with at least 9 credits[1] at the 400 level[60] (Sem: 3-8)
Select 12-26 credits from program list (Students may apply 6 credits of ROTC.) (Sem: 1-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
[60] Physical sciences include ASTRO, CHEM, PHYS; mathematical sciences include CMPSC, CSE, MATH, STAT; life sciences include BIOL, BIOTC, B M B, MICRB.

SCIENCE, B.S.

Abington College; Altoona College; Berks-Lehigh Valley College; Commonwealth College; Eberly College of Science; Integrated Five-Year Science/Business MBA Program

The Science major is an interdisciplinary degree that aims to provide a broad, general education in science. The bachelor of science (B.S.) curriculum is designed specifically for students who have education goals relating to scientific theory and practice and who require a high degree of flexibility to obtain their educational objectives. After completing foundation courses in calculus, chemistry, physics, and the life sciences, students will select additional science courses from designated areas. A large number of supporting credits permit students to readily include significant breadth or specialization into their undergraduate curriculum. Some examples include minors in business, computer and information science, education, kinesiology, or other fields. The degree allows students throughout the Commonwealth to become familiar with both the theory and the practice of science. It can help prepare students for various careers in pharmaceutical, biotechnical, chemical, medical, and agricultural industries. The degree can also be tailored to meet the specific requirements of professional programs such as medical, dental, or pharmacy schools. The General Science option of the B.S. Science degree allows for the most flexibility. Achievement in a more specialized set of goals can be met by selecting one of the other three B.S. options offered: the Life Sciences option, the Mathematical Sciences option, or the Physical Sciences option. Not all of these options are available at all locations, so see the Science program director at your college for further details.

In order to be eligible for entrance to the Science major, a student at any location must have: 1) attained at least a 2.00 cumulative grade-point average; 2) completed MATH 140 GQ(4) with a grade of C or better; 3) completed at least two of the following courses, BIOL 110 GN(4); CHEM 012 GN(3); PHYS 211 GN(4) or PHYS 250 GN(4), with a grade of C or better.

TWO-YEAR PREPROFESSIONAL PREPARATION: The first two years of the Science major (62 credits) can meet the preprofessional needs of those interested in admission to some schools of pharmacy, physical therapy, optometry, nursing, and physician assistant training. Successful students can then transfer after two years of undergraduate study to the professional school to which they are admitted. Note, however, that no Penn State degree can be awarded after only two years (62 credits) of study in the Science major. Also, note that the abbreviated two-year curriculum alone does not prepare students for admission to professional schools of general medicine, veterinary medicine, or dental medicine. Consult with your college's health sciences professional adviser for additional information.

FIVE-YEAR SCIENCE/BUSINESS, B.S./M.B.A., PROGRAM: Students admitted to this special cooperative program between the Eberly College of Science and The Smeal College of Business Administration will be able to earn a B.S. degree in Science (General option) upon satisfactory completion of:

a. A total of 92 credits, including General Education credits in Health and Physical Activity, Writing/Speaking, Arts, Humanities, and Social and Behavioral Sciences; MATH 140 GQ(4), MATH 141 GQ(4); STAT 200 GQ(4); CMPSC 203 GQ(4); CHEM 012 GN(3), CHEM 013 GN(3), CHEM 014 GN(1), CHEM 015 GN(1); PHYS 250 GN(4), PHYS 251 GN(4); BIOL 110 GN(4); SC 285(1); ECON 002 GS(3)[58], ECON 004 GS(3)[58]; ACCTG 211(3), a 3-credit elective course from the College of Earth and Mineral Sciences, a 3-credit elective course in life sciences, and 15 credits of electives from the Eberly College of Science, including 9 credits at the 400 level.

b. 4-12 credits of summer independent study work through the Eberly College of Science Cooperative Education Program.

c. The first year of the M.B.A. program in Smeal College of Business.

For the B.S. degree in Science, a minimum of 124 credits is required, with at least 15 credits at the 400 level.

GENERAL EDUCATION: 45 credits
(15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in GENERAL EDUCATION course selection or SUPPORTING COURSES AND RELATED AREAS)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection or SUPPORTING COURSES AND RELATED AREAS)
WRITING ACROSS THE CURRICULUM: (Included in GENERAL EDUCATION course selection or REQUIREMENTS FOR THE MAJOR or SUPPORTING COURSES AND RELATED AREAS)

REQUIREMENTS FOR THE MAJOR: 94 credits
(This includes 15 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses.)

COMMON REQUIREMENTS FOR MAJOR (ALL OPTIONS): 29-37 credits

PRESCRIBED COURSES (20 credits)
CHEM 012 GN(3)[1], CHEM 013 GN(3), CHEM 014 GN(1), CHEM 015 GN(1), MATH 140 GQ(4)[1], MATH 141 GQ(4) (Sem: 1-2)
BIOL 110 GN(4)[1] (Sem: 1-4)

ADDITIONAL COURSES (3 credits)
Select 3 credits from B M B 211(3), B M B 251(3), or MICRB 201(3) (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (6-14 credits)
Select 6 credits of 400-level courses (Sem: 5-8)
Select 0-8 credits in a foreign language (proficiency demonstrated by examination or course work to the level of the second semester; if fewer than 8 credits are needed to reach the required proficiency, students choose selections from program list to total 8 credits) (Sem: 1-8)

REQUIREMENTS FOR THE OPTION: 57-65 credits

GENERAL SCIENCE OPTION: 57-65 credits

ADDITIONAL COURSES (11-16 credits)
Select 3-4 credits from CMPSC 101 GQ(3), MATH 230(4), MATH 250(3), or STAT 200 GQ(4) (Sem: 3-4)
PHYS 211 GN(4)[1], PHYS 212 GN(4), PHYS 213 GN(2), PHYS 214 GN(2); or PHYS 250 GN(4)[1], PHYS 251 GN(4) (Sem: 3-6)

SUPPORTING COURSES AND RELATED AREAS (41-54 credits)
(A maximum of 12 credits of Independent Study [296, 496] may be applied toward credits for graduation.)
Select 3 credits from earth and mineral sciences (Sem: 3-8)
Select 18 credits in life, mathematical, or physical sciences, with at least 9 credits[1] at the 400 level[60] (Sem: 3-8)
Select 20-33 credits from program list (Students may apply 6 credits of ROTC.) (Sem: 1-8)

LIFE SCIENCE OPTION: 57-65 credits

ADDITIONAL COURSES (21-27 credits)
Select 4 credits from BIOL 220W GN(4), BIOL 230W GN(4), BIOL 240W GN(4) (Sem: 3-4)
Select 3 credits from CMPSC 101 GQ(3), MATH 250(3), or STAT 250 GQ(3) (Sem: 3-4)
CHEM 034(3), CHEM 035(3); or CHEM 038(3), CHEM 039(3), CHEM 036(2) (Sem: 3-6)
PHYS 211 GN(4)[1], PHYS 212 GN(4), PHYS 213 GN(2), PHYS 214 GN(2); or PHYS 250 GN(4)[1], PHYS 251 GN(4) (Sem: 3-6)

SUPPORTING COURSES AND RELATED AREAS (30-44 credits)
(A maximum of 12 credits of Independent Study [296, 496] may be applied toward credits for graduation.)
Select 9 credits[1] of 400-level B M B, BIOL, BIOTC, or MICRB courses (Sem: 5-8)
Select 21-35 credits from program list (Students may apply 6 credits of ROTC.) (Sem: 1-8)

MATHEMATICAL SCIENCE OPTION: 57-65 credits

PRESCRIBED COURSES (5 credits)
CSE 120(3), MATH 220 GQ(2) (Sem: 3-6)

ADDITIONAL COURSES (21-26 credits)
CMPSC 201C GQ(3), CMPSC 201F GQ(3), or CSE 103 GQ(4) (Sem: 3-6)
MATH 230(4) or MATH 251(4) (Sem: 3-6)
CSE 260(3) or MATH 311W(3); STAT 301 GQ(3) or STAT 318(3) (Sem: 3-8)
PHYS 211 GN(4)[1], PHYS 212 GN(4), PHYS 213 GN(2), PHYS 214 GN(2); or PHYS 250 GN(4)[1], PHYS 251 GN(4) (Sem: 3-8)

SUPPORTING COURSES AND RELATED AREAS (26-39 credits)
(A maximum of 12 credits of Independent Study [296, 496] may be applied toward credits for graduation.)
Select 9 credits[1] of 400-level CMPSC, CSE, MATH, or STAT courses (Sem: 5-8)
Select 17-30 credits from program list (Students may apply 6 credits of ROTC.) (Sem: 1-8)

PHYSICAL SCIENCE OPTION: 57-65 credits

PRESCRIBED COURSES (15 credits)
ASTRO 291 GN(3), PHYS 211 GN(4)[1], PHYS 212 GN(4), PHYS 213 GN(2), PHYS 214 GN(2) (Sem: 3-6)

ADDITIONAL COURSES (13-16 credits)
CHEM 034(3), CHEM 035(3); or CHEM 038(3), CHEM 039(3), CHEM 036(2) (Sem: 3-6)
MATH 230(4) or MATH 251(4) (Sem: 3-6)
Select 3-4 credits from ASTRO 292 GN(3)/ASTRO 293(1); E MCH 011(3); M E 030(3); or PHYS 237(3) (Sem: 3-8)

SUPPORTING COURSES AND RELATED AREAS (26-37 credits)
(A maximum of 12 credits of Independent Study [296, 496] may be applied toward credits for graduation.)
Select 9 credits[1] of 400-level ASTRO, CHEM, or PHYS courses (Sem: 5-8)
Select 17-28 credits from program list (Students may apply 6 credits of ROTC.) (Sem: 1-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
[58] ECON 002 GS and ECON 004 GS may be used to satisfy General Education in the social and behavioral sciences.
[60] Physical sciences include ASTRO, CHEM, PHYS; mathematical sciences include CMPSC, CSE, MATH, STAT; life sciences include BIOL, BIOTC, B M B, MICRB.

SCIENCE, B.A.

Penn State Erie, The Behrend College

This major provides broad, general training with a background in science. It allows students to prepare for graduate studies in their field of interest. Most graduates of the Science major go on to graduate school in order to obtain employment in research. Other students choose this major because of an educational objective more readily obtained by it than by some specific subject matter.

For the B.A. degree in Science, a minimum of 120 credits is required. Each student must earn at least a grade of C in each 300- and 400-level course in the major field.

GENERAL EDUCATION: 45 credits
(18 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selections or BACHELOR OF ARTS DEGREE REQUIREMENTS)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 7-11 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 58-82 credits
(At least 6 credits must be at the 400 level.)
(This includes 18 credits of General Education courses; 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GWS courses.)
PRESCRIBED COURSES (23 credits)
CHEM 012 GN(3), CHEM 013 GN(3), CHEM 014 GN(1), CHEM 015 GN(1), MATH 140 GQ(4), MATH 141 GQ(4) (Sem: 1-2)
ENGL 202C GWS(3) (Sem: 1-4)
MATH 230(4) (Sem: 3-4)

ADDITIONAL COURSES (8-12 credits)
PHYS 250 GN(4), PHYS 251 GN(4) or PHYS 211 GN(4), PHYS 212 GN(4), PHYS 213 GN(2), PHYS 214 GN(2) (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (27 credits)
Select 9 credits of biological sciences from General Education courses (Sem: 1-2)
Select 3 credits of arts or humanities (Sem: 1-8)
Select 15 credits: 12 credits in category a, b, c, or d and 3 additional credits in any one of the categories: (Sem: 5-8)
a. biological sciences
b. earth and material sciences
c. mathematical sciences
d. physical sciences

SCIENCE, B.S.

Penn State Erie, The Behrend College

This interdisciplinary major provides a broad, general education in science. The B.S. degree major includes options in General Science and Environmental Studies, and in Earth and Space Science Pre-certification and General Science Pre-certification for teaching. The curriculum is designed for students who have educational goals not readily met by one of the science majors or for those who require a high degree of flexibility to attain their educational objectives. After completing foundation courses in calculus, chemistry, computer science, the life sciences, and physics, students select additional science courses from designated areas. A large number of

supporting credits will permit students to include a minor or course sequences in business, education, technical writing, or other fields.

For the B.S. degree in Science, a minimum of 120 credits is required, with at least 15 credits at the 400 level. Each student must earn at least a grade of C in each 300- and 400-level prescribed, additional, and supporting course.

GENERAL EDUCATION: 45 credits
(15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES (0-1 credit)

REQUIREMENTS FOR THE MAJOR: 89-90 credits[80]
(This includes 15 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 44-46 credits

PRESCRIBED COURSES (24 credits)
BIOL 110 GN(4)[1] (Sem. 1-4)
CHEM 012 GN(3)[1], CHEM 013 GN(3), CHEM 014 GN(1), CHEM 015 GN(1), MATH 140 GQ(4)[1], MATH 141 GQ(4) (Sem: 1-2)
CSE 103(4) (Sem: 1-4)

ADDITIONAL COURSES (12-14 credits)
PHYS 211 GN(4)[1], PHYS 212 GN(4), PHYS 213 GN(2) or PHYS 214(2); or PHYS 250 GN(4)[1], PHYS 251 GN(4) (Sem: 3-6)
Select 4 credits from BIOL 220W GN(4), BIOL 230W GN(4), BIOL 240W GN(4) (Sem: 3-6)

SUPPORTING COURSES AND RELATED AREAS (8 credits)
Select 8 credits in a foreign language (proficiency demonstrated by examination or course work to the level of the second semester; if fewer than 8 credits are needed to reach the required proficiency, students choose selections from program list to total 8 credits) (Sem: 1-8)

REQUIREMENTS FOR THE OPTION: 43-46 credits[81]

GENERAL SCIENCE OPTION: 43-46 credits

ADDITIONAL COURSES (3-4 credits)
Select 3-4 credits from CSE 120 GQ(3), MATH 230(4), MATH 250(3), or STAT 200 GQ(4) (Sem: 3-6)

SUPPORTING COURSES AND RELATED AREAS (39-43 credits)
Select 3 credits from geosciences[79] (Sem: 1-8)
Select 18 credits, with at least 9 credits at the 400 level, in one of these areas: computer sciences, life sciences, mathematical sciences, or physical sciences[79] (Sem: 3-8)
Select 18-22 credits, with at least 6 credits at the 400 level, from program list (Students may apply 6 credits of basic ROTC.) (Sem: 1-8)

ENVIRONMENTAL STUDIES OPTION: 43-46 credits

PRESCRIBED COURSES (7 credits)
BIOBD 401W(3), GEOG 121 GS(3), GEOGR 122(1) (Sem: 3-8)

ADDITIONAL COURSES (9-11 credits)
Select 3-4 credits from BIOL 220W GN(4), BIOL 230W GN(4), BIOL 240W GN(4),
or MICRB 201 GN(3) (Sem: 3-6)
CHEM 034(3) or CHMBD 221(4) (Sem: 3-6)
STAT 200 GQ(3) or STAT 250 GQ(3) (Sem: 3-8)

SUPPORTING COURSES AND RELATED AREAS (25-30 credits)
Select 6 credits from geosciences[79] [82] (Sem: 3-8)
Select 6 credits of 400-level courses in computer sciences, life sciences, mathematical sciences, or physical sciences[79] (Sem: 5-8)

Select 9-16 credits from Environmental Studies option program list with at least 6 credits with ECON, ECNS, PL SC, or POLSC designations and at least 5-7 credits at the 400 level (Students may apply 6 credits of basic ROTC.) (Sem: 1-8)
Select 2-4 credits of 400-level research, internship, field school, or studies abroad[80] (Sem: 5-8)

EARTH AND SPACE SCIENCE PRE-CERTIFICATION OPTION: 43-46 credits
(This option is designed to prepare students in pre-certification for teaching earth and space science.)

PRESCRIBED COURSES (15 credits)
ASTRO 010 GN(2), ASTRO 011 GN(1), GEOSC 002 GN(3), GEOSC 020 GN(3), GEOSC 040 GN(3), METEO 003 GN(3) (Sem: 1-4)

ADDITIONAL COURSES (6 credits)
Select 6 credits from ASTRO 291 GN(3), ASTRO 292 GN(3), GEOG 010 GN(3), or GEOSC 010 GN(3) (Sem: 3-8)

SUPPORTING COURSES AND RELATED AREAS (22-25 credits)
Select 6 credits from the geosciences[79][82] (Sem: 5-8)
Select at least 6 credits at the 400 level in one of the following areas: computer sciences, life sciences, mathematical sciences, or physical sciences[79] (Sem:5-8)
Select 10-13 credits, with at least 6-9 credits at the 400 level, from the program list (Students may apply 6 credits of basic ROTC.)[80] (Sem: 1-8)

GENERAL SCIENCE PRE-CERTIFICATION OPTION: 43-46 credits
(This option is designed to prepare students in pre-certification for teaching general science.)

PRESCRIBED COURSES (19 credits)
ASTRO 010 GN(2), ASTRO 011 GN(1), BIOL 230W GN(4), GEOSC 002 GN(3), GEOSC 020 GN(3), GEOSC 040 GN(3), METEO 003 GN(3) (Sem: 1-4)

ADDITIONAL COURSES (7-8 credits)
Select 3-4 credits from CSE 120 GQ(3), MATH 230(4), MATH 250(3), or STAT 200 GQ(4) (Sem: 3-6)
Select 4 credits from BIOL 220W GN(4) or BIOL 240W GN(4) (Sem: 3-6)

SUPPORTING COURSES AND RELATED AREAS (16-20 credits)
Select at least 6 credits at the 400 level in one of the following areas: computer sciences, life sciences, mathematical sciences, or physical sciences[79] (Sem: 5-8)
Select 10-14 credits, with 6-9 credits at the 400 level, from the program list (Students may apply 6 credits of basic ROTC.)[80] (Sem: 1-8)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
[79]Computer sciences include CENBD, CMPBD, CMPSC, CSE; geosciences include GEOG, GEOSC, MATSC, MATSE; life sciences include BIOBD, BIOL, B M B, MICRB; mathematical sciences include MATH, MTHBD, STABD, STAT; physical sciences include ASTRO, CHEM, CHMBD, PHYBD, PHYS.
[80]A student in this major must complete at least 15 credits of 400-level courses and 3 credits of W courses in prescribed, additional, or supporting courses from one of the areas: computer science, life sciences, mathematical sciences, or physical sciences.
[81]A maximum of 8 credits of Research (494), Internship (495), or Independent Study (296, 496) may be applied toward credits for graduation in all options.
[82]In addition to courses used to satisfy the prescribed courses requirement.

SECONDARY EDUCATION

College of Education

The following teaching options are available for majors in Secondary Education: Bilingual Education, Biological Science, Chemistry, Earth and Space Science, English/Communication, French, German, Latin, Mathematics, Physics, Russian, Social Studies, and Spanish. General Science teacher certification requirements may be completed only in conjunction with the Biological Science, Chemistry, or Earth and Space Science Teaching options. Environmental Education teacher certification requirements may be completed in conjunction with the Biological Science, Earth and Space Science, and Social Studies Teaching options.

The Secondary Education major helps prepare students for middle school and/or high school teaching positions and for other employment in fields related to their content specialties.

The executive vice president and provost of the University has approved administrative enrollment controls for this major. The number of students admitted each year to this major is limited. Additional information about applying for this major is available in the dean's office in the College of Education.

For the B.S. degree in Secondary Education, 120-147 credits are required. (See also Teacher Education Programs.)

GENERAL EDUCATION: 45 credits
(3-21 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 0-10 credits

REQUIREMENTS FOR THE MAJOR: 74-113 credits
(This includes 3-21 credits of General Education courses, i.e., ALL options: 3 credits of GS. Plus ALL FOREIGN LANGUAGE teaching options: 3 additional credits of GS; GERMAN, LATIN, SPANISH, and RUSSIAN teaching options: 3 additional credits of GH. BIOLOGICAL SCIENCE, and EARTH and SPACE teaching options: additional 9 credits of GN, 4 credits of GQ, 3 credits of GS; CHEMISTRY and PHYSICS teaching options: additional 9 credits of GN, 6 credits of GQ, 3 credits of GS. MATH teaching option: additional 6 credits of GQ; SOCIAL STUDIES teaching option: additional 3 credits of GS, 6 credits of GH. In the BILINGUAL teaching option: 3 credits of GH may be selected. In the ENGLISH/COMMUNICATIONS teaching option an additional 3 credits of GS, 6 credits of GA, and 6 credits of GH may be selected.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 38-39 credits[18]

PRESCRIBED COURSES (35-36 credits)
C I 295(2-3), EDPSY 014(3), EDTHP 115(3), PSY 002 GS(3) (Sem: 1-2)
C I 412W(3), C I 495C(3), PSY 426(3) (Sem: 5-8)
C I 495E(15) (Sem: 7-8)

ADDITIONAL COURSES (3 credits)
Select 3 credits at the 400 level of any EDTHP course. (Sem: 5-8)

REQUIREMENTS FOR THE OPTION: 36-75 credits

BILINGUAL TEACHING OPTION: 36 credits[18]
Students who complete the requirements for this option will be able to apply for a Bilingual Teaching certificate in thirty-two states. Students selecting this option must be bilingual upon entering this program. Proficiency must be demonstrated by oral and written examination. This option includes 3-6 credits of General Education courses.

For the B.S. degree with this option, 120 credits are required.

PRESCRIBED COURSES (24 credits)
CAS 470(3), CAS 497(3), LL ED 424(3), LL ED 425(3), LL ED 445(3), LL ED 495(6) (Sem: 5-8)
SOC 430(3) (Sem: 5-6)

ADDITIONAL COURSES (12 credits)
(Advanced language other than English)
Select 12 credits from one group — A, B, C, D, or E:
A. Spanish
SPAN 200(3), SPAN 253W(3), SPAN 354(3) (Sem: 3-6)
SPAN 400(3), SPAN 414(3), or SPAN 440(3) (Sem: 5-8)
B. French
FR 201(4), FR 202(3), FR 330(3), FR 350(3) (Sem: 3-6)
FR 401(3), FR 417(3), or FR 440(3) (Sem: 5-8)
C. German
GER 100 GH;DF(3), GER 201(4), GER 301(3) (Sem: 3-6)
GER 401(3), GER 411(3) (Sem: 5-8)
D. Latin
CAMS 033 GH(3), CAMS 034(3), or LATIN 496(3-9) (Sem: 5-8)
E. Russian
RUS 100 GH;DF(3), RUS 204(3), RUS 214(3), RUS 221(3), RUS 304(3), RUS 305(3), RUS 360(3) (Sem: 3-6)
RUS 430(3), RUS 460(3) (Sem: 5-8)

BIOLOGICAL SCIENCE TEACHING OPTION: 74-75 credits[18]
This option enables the graduate to meet all of the academic requirements for the Instructional I certificate for teaching at the secondary-school level, which is issued by the Pennsylvania Department of Education. This option includes 19 credits of General Education courses.

For the B.S. degree with this option, 138-140 credits are required.

PRESCRIBED COURSES (69 credits)
B M B 211(3), B M B 212(1), BIOL 110 GN(4), BIOL 220W GN(4) (Sem: 1-4)
BIOL 230W GN(4), BIOL 240W GN(4), CHEM 012 GN(3), CHEM 013 GN(3), CHEM 014 GN(1), CHEM 015 GN(1), MATH 140 GQ(4), PHYS 250 GN(4), PHYS 251 GN(4), S T S 200 GS(3) (Sem: 3-6)
MICRB 201(3), MICRB 202(2), SCIED 410(3), SCIED 411(3), SCIED 412(3), SCIED 457(3) (Sem: 5-8)
CHEM 034(3), GEOSC 020 GN(3), METEO 003 GN(3) (Sem: 5-8)

ADDITIONAL COURSES (2 credits)
AG SC 296(2), BIOL 496(2), B M B 496(2), MICRB 496(2), or NUTR 296(2) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (3-4 credits)
BIOL 417(4) or select 3 credits from 400-level applied fields of biology (Sem: 5-8)

Note 1: The General Science certificate may be earned by completing 3 additional credits—ASTRO 010 GN(2) and ASTRO 011 GN(1).
Note 2: The Environmental Education certificate may be earned by completing R P M 325(3); AG ED 395(1-13) or R P M 430(3); 3 credits from E R M 411(3), E R M 412(3), or E R M 413W(3); 3 credits from earth or soil sciences; 3 credits from ASTRO 010 GN(2) and ASTRO 011 GN(1) or METEO 003 GN(3); and 3 credits from AG BM 101 GS(3), ECON 002 GS(3), ECON 004 GS(3), or ECON 014 GS(3).
Note 3: A laboratory safety module and Red Cross certification in First Aid and CPR must be completed for certification. Red Cross certification may be completed through KINES 303 GHS(3).

CHEMISTRY TEACHING OPTION: 70-71 credits[18]
This option enables the graduate to meet all of the academic requirements for the Instructional I certificate for teaching at the secondary-school level, which is issued by the Pennsylvania Department of Education. This option includes 21 credits of General Education courses.

For the B.S. degree with this option, 132-134 credits are required.

PRESCRIBED COURSES (57-58 credits)
CHEM 012 GN(3), CHEM 013 GN(3), CHEM 014 GN(1), CHEM.015 GN(1), MATH 140 GQ(4), MATH 141 GQ(4), PHYS 211 GN(4), PHYS 212 GN(4), PHYS 213 GN(2), PHYS 214 GN(2) (Sem: 1-4)
B M B 101(3), B M B 102(1), CHEM 034(3), CHEM 035(3), S T S 200 GS(3) (Sem: 3-8)
CHEM 451(3), CHEM 452(3), CHEM 457(1-2), SCIED 410(3), SCIED 411(3), SCIED 412(3) (Sem: 5-8)

ADDITIONAL COURSES (7 credits)
BIOL 011 GN(3) and BIOL 012 GN(1); or BIOL 110 GN(4); CHEM 425(3) or CHEM 426(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 3 credits in chemistry (Sem: 5-8)
Select 3 credits in chemistry or an applied field of chemistry (Sem: 5-8)

Note 1: The General Science certificate may be earned by completing 13 additional credits from ASTRO 010 GN(2), ASTRO 011 GN(1), GEOSC 020 GN(3), METEO 003 GN(3), SCIED 457(3), and 1 credit selected from ASTRO 296(1-18), BIOL 296(1-18), CHEM 389(1-4), GEOSC 296(1-18), or METEO 296(1-18).
Note 2: A laboratory safety module and Red Cross certification in First Aid and CPR must be completed for certification. Red Cross certification may be completed through KINES 303 GHS(3).

EARTH AND SPACE SCIENCE TEACHING OPTION: 62-63 credits[18]
This option enables the graduate to meet all of the academic requirements for the Instructional I certificate for teaching at the secondary-school level, which is issued by the Pennsylvania Department of Education. This option includes 19 credits of General Education courses.

For the B.S. degree with this option, 126-128 credits are required.

PRESCRIBED COURSES (28 credits)
GEOSC 002 GN(3), MATH 140 GQ(4), METEO 003 GN(3) (Sem: 1-4)
ASTRO 010 GN(2), ASTRO 011 GN(1), S T S 200 GS(3) (Sem: 3-8)
SCIED 410(3), SCIED 411(3), SCIED 412(3), SCIED 457(3) (Sem: 5-8)

ADDITIONAL COURSES (31-32 credits)
BIOL 011 GN(3), BIOL 012 GN(1); or BIOL 110 GN(4) (Sem: 1-4)
GEOSC 001(3) or GEOSC 020 GN(3) (Sem: 1-5)
GEOSC 040 GN(3) or METEO 022(2) (Sem: 1-5)
Select 6 credits in GEOSC or 6 credits from GEOG 110 GN(3), GEOG 115 GN(3), GEOG 432W(3), GEOG 433W(3) (Sem: 1-6)
Select a or b below (16):
a. CHEM 012 GN(3), CHEM 014 GN(1); CHEM 013 GN(3), CHEM 015 GN(1); PHYS 250 GN(4), PHYS 251 GN(4) (Sem: 1-5)

b. CHEM 012 GN(3), CHEM 014 GN(1); PHYS 201 GN(4), PHYS 202 GN(4), PHYS 204 GN(4) (Sem: 3-6)

SUPPORTING COURSES AND RELATED AREAS (3 credits)
Select 3 credits from GEOSC 200(3), GEOSC 201(4), GEOSC 303(3), GEOSC 330(2), GEOSC 340(3), GEOSC 438(3), GEOSC 445(4), GEOSC 470W(3) (Sem: 3-8)

Note 1: The General Science certificate may be earned by completing this option.
Note 2: The Environmental Education certificate may be earned by completing R P M 325(3); AG ED 395(1-13) or R P M 430(3); B! SC 003 GN(3) or BIOL 220W GN(4); 3 credits from E R M 411(3), E R M 412(3), or E R M 413W(3); 5 additional credits from biological and environmental sciences; and 3 credits from AG BM 101 GS(3), ECON 002 GS(3), ECON 004 GS(3), ECON 014 GS(3).
Note 3: A laboratory safety module and Red Cross certification in First Aid and CPR must be completed for certification. Red Cross certification may be completed through KINES 303 GHS(3).

ENGLISH/COMMUNICATION TEACHING OPTION: 63 credits[18]
This option enables the graduate to meet all of the academic requirements for the Instructional I certificate for teaching at the secondary-school level, which is issued by the Pennsylvania Department of Education. This program has a Language and Literature Core and a Media Literacies Core. This program is open to students outside the College of Education who desire certification. This option includes 18 credits of General Education courses.

For the B.S. degree with this option, 128-129 credits are required.

LANGUAGE AND LITERATURE CORE: 42 credits

PRESCRIBED COURSES (12 credits)
LL ED 411(3), LL ED 412(3), LL ED 420(3) (Sem: 5-8)
ENGL 444(3) (Sem: 5-6)

ADDITIONAL COURSES (30 credits)
a) Select 3 credits from: AAA S 100 GS;GI(3), AM ST 105 GH;DF(3), ANTH 146 GS;GI(3), CMLIT 001 GH(3), CMLIT 002 GH;GI(3), CMLIT 003 GH;GI(3), CMLIT 004 GH;GI(3), CMLIT 005 GH;GI(3), CMLIT 010 GH;GI(3), CMLIT 100 GH;GI(3), CMLIT 101 GH;DF(3), CMLIT 105 GH;GI(3), CMLIT 106 GH;GI(3), CMLIT 107 GH;GI(3), CMLIT 108 GH;GI(3), CMLIT 110 GH;GI(3), CMLIT 111 GH;GI(3), CMLIT 141 GH;GI(3), CMLIT 184 GH(3), CMLIT 185 GH(3), CMLIT 189 GH(3), ENGL 135 GH;GI(3), ENGL 139 GH;GI(3), ENGL 194 GH;GI(3), ENGL 235 GI(3), ENGL 262 GH(3), ENGL 263 GH(3), ENGL 265 GH(3), ENGL 268 GH(3), PHIL 006 GH(3), RUS 110 GH;GI(3), RUS 120 GH;GI(3), RUS 130 DF(3), RUS 141W(3), RUS 142W(3), or WMNST 003 GH;DF(3) (Sem: 1-4)
b) Select 3 credits from: ENGL 221W(3), ENGL 222W(3), ENGL 231W(3), or ENGL 232W(3) (Sem: 3-6)
c) Select 3 credits from: ENGL 261(3), ENGL 262(3), ENGL 263(3), ENGL 265(3), ENGL 268(3) (Sem: 3-6)
d) Select 3 credits from: AM ST 493(3), CMLIT 400W(3), CMLIT 401W(3), CMLIT 402W(3), CMLIT 404(3), CMLIT 405(3), CMLIT 406(3), CMLIT 408(3), CMLIT 422(3), CMLIT 423(3), CMLIT 470(3), CMLIT 480(3), CMLIT 486(3), CMLIT 487(3), CMLIT 488(3), ENGL 431 GI(3-6), ENGL 452(3), ENGL 453(3), ENGL 461 GI(3), ENGL 462 GI(3), ENGL 463 GI(3), ENGL 466 GI(3), ENGL 467 GI(3), ENGL 468 GI(3), ENGL 469 GI(3), or ENGL 490 GI(3) (Sem: 5-8)
e) Select 3 credits from: ENGL 430(3), ENGL 432(3), ENGL 433(3), ENGL 435(3), ENGL 436(3), ENGL 437(3), ENGL 438(3), or ENGL 439(3) (Sem: 5-8)
f) Select 3 credits from: ENGL 441(3), ENGL 442(3), ENGL 443(3), ENGL 445(3), ENGL 446(3), ENGL 447(3), ENGL 448(3), ENGL 450(3), ENGL 452(3), ENGL 453(3), ENGL 454(3), ENGL 456(3), ENGL 457(3), or ENGL 458(3) (Sem: 5-8)
g) Select 3 credits from: ENGL 100(3), ENGL 407(3), ENGL 417(3), or LING 100(3) (Sem: 5-6)
h) Select 3 credits from: CAS 214W(3), ENGL 212(3), ENGL 213(3), ENGL 215(3), ENGL 281(3), ENGL 421(3), or THEA 440(3) (Sem: 5-6)
i) Select 3 credits from; CAS 215(3), CAS 415(3), CAS 438(3), CAS 475(3), ENGL 470(3), ENGL 471(3-6), ENGL 472(3-6), ENGL 473(3-6), ENGL 474(3-6) (Sem: 7-8)
j) Select any 3 credits from cluster a, d, g, or i

MEDIA LITERACIES CORE: 21 credits

PRESCRIBED COURSES (3 credits)
LL ED 480 DF(3) (Sem: 5-6)

ADDITIONAL COURSES (18 credits)
k) Select 3 credits from: COMM 100 GS(3), COMM 150(3), COMM 205 GI(3), COMM 405(3), COMM 411(3), COMM 413(3) (Sem: 1-4)
l) Select 3 credits from: CAS 280W(3), CAS 480(3), or SPCOM 485(3) (Sem: 5-8)
m) Select 3 credits from: CAS 211(3), CAS 213(3), CAS 250(3)

Select 9 credits within one, or across several, of the following media literacy areas:
Multimedia: ART 100 GA(3), ART 290 GA(3), ART H 111 GA(3), ART H 112 GA(3), ART H 120 GA;GI(3), ART H 130 GA;GI(3), CAS 175 GH(3), CAS 415(3), COMM 100 GS(3), COMM 120(3), COMM 150 GA(3), COMM 180(3), COMM 250 GA(3), COMM 453(3), COMM 454(3), L A 283(3), L A 483(3), WMNST 205 DF(3) (Sem: 1-8)
Theatre: THEA 102 GA(3), THEA 160(3), THEA 170(3), THEA 180(3), THEA 210(3), THEA 426(3), THEA 428(3), or one of the following: THEA 103(3), THEA 104(3), or THEA 110(3) (Sem: 1-8)
Print Journalism: COMM 260W(3), COMM 261(3), COMM 401(3), COMM 403(3), COMM 409(3), COMM 462(3), COMM 463(3-6), COMM 464(3) (Sem: 3-8)
Speech Communication: CAS 202 GS(3), CAS 211(3), CAS 213(3), CAS 215(3), CAS 250(3), CAS 280W(3), CAS 411(3), CAS 422 GI(3), SPCOM 220(3), or SPCOM 455 GI(3) (Sem: 3-8)
Instructional Systems: INSYS 200(3), INSYS 400(1-3), INSYS 441(3), INSYS 446(3), INSYS 447(3), INSYS 448(3), INSYS 449(3) (Sem: 3-8)
Bilingual Education: LL ED 424(3), LL ED 425(3), LL ED 445(3), SOC 430(3), SPCOM 471 GI(3), SPCOM 482(3), SPCOM 491(3), SPCOM 493(3) (Sem: 3-8)

FRENCH TEACHING OPTION: 40-52 credits[18]
This option requires credits in French beyond the intermediate level. In general, students are encouraged to take at least one course in French each semester without interruption. Students are also encouraged to participate in the study abroad program but should declare such intention as early as possible. Completion of this option leads to the Instructional I certificate for teaching, which is issued by the Pennsylvania Department of Education. This option includes 6 credits of General Education courses.

For the B.S. degree with this option, 120-130 credits are required.

PRESCRIBED COURSES (34-46 credits)
Proficiency in French must be demonstrated by either examination or course work equivalent to the completion of 12 credits. (Sem: 3-4)
ANTH 045 GS;DF(3), FR 201(4), FR 202(3), FR 330(3), FR 351(3), FR 401(3), FR 402W(3), FR 417(3), FR 440(3), LL ED 424(3), LL ED 445(3) (Sem: 5-8)

ADDITIONAL COURSES (6 credits)
Select 6 credits of FR at the 400 level (Sem: 5-8)

Note: Proficiency tests in reading, writing, speaking, and listening in French must be satisfied for certification.

GERMAN TEACHING OPTION: 40-52 credits[18]
This option requires credits in German beyond the intermediate level. In general, students are encouraged to take at least one course in German each semester without interruption. Students are also encouraged to participate in the study abroad program but should declare such intention as early as possible. Completion of this option leads to the Instructional I certificate for teaching, which is issued by the Pennsylvania Department of Education. This option includes 9 credits of General Education courses.

For the B.S. degree with this option, 120-127 credits are required.

PRESCRIBED COURSES (25-37 credits)
Proficiency in German must be demonstrated by either examination or course work equivalent to the completion of 12 credits. (Sem: 3-4)
ANTH 045 GS;DF(3), GER 100 GH;DF(3), GER 201(4), GER 301(3) (Sem: 3-6)
GER 401(3), GER 411(3), LL ED 424(3), LL ED 445(3) (Sem: 5-8)

ADDITIONAL COURSES (15 credits)
Select 6 credits from GER 200 GH;GI(3), GER 320(3), GER 321(3), or GER 322(3) (Sem: 1-4)
Select 3 credits in GER at the 400 level (Sem: 3-4)
GER 330(3) or GER 331(3); GER 412(3) or GER 430(3) (Sem: 5-8)

Note: Proficiency tests in reading, writing, speaking, and listening in German must be satisfied for certification.

LATIN TEACHING OPTION: 39-51 credits[18]
This option requires credits in Latin beyond the intermediate level. In general, students are encouraged to take at least one course in Latin each semester without interruption. Students are also encouraged to participate in the study abroad program, but should declare such intention as early as possible. Completion of this option leads to the Instructional I certificate for teaching, which is issued by the Pennsylvania Department of Education. This option includes 9 credits of General Education courses.

For the B.S. degree with this option, 120-126 credits are required.

PRESCRIBED COURSES (21-33 credits)
Proficiency in Latin must be demonstrated by either examination or course work equivalent to the completion of 12 credits (Sem: 3-4)

ANTH 045 GS;DF(3), CAMS 033 GH(3), CAMS 034(3), LATIN 100(3) (Sem: 1-4)
LATIN 496(3), LL ED 424(3), LL ED 445(3) (Sem: 5-8)

ADDITIONAL COURSES (18 credits)
Select 12 credits in LATIN at the 400 level (Sem: 5-8)
Select 6 credits in LATIN and related courses at the 400 level (Sem: 5-8)

Note: Proficiency tests in reading, writing, speaking, and listening in Latin must be satisfied for certification.

MATHEMATICS TEACHING OPTION: 48-49 credits[18]
This option enables the graduate to meet all of the academic requirements for the Instructional I certificate for teaching at the secondary-school level, which is issued by the Pennsylvania Department of Education. This option includes 9 credits of General Education courses.

For the B.S. degree with this option, 122-124 credits are required.

PRESCRIBED COURSES (33 credits)
MATH 140 GQ(4), MATH 141 GQ(4) (Sem: 1-2)
CMPSC 101 GQ(3), MATH 220(2), MATH 231(2), MATH 311W(3) (Sem: 3-6)
MATH 310(3), MATH 418(3), MTHED 411(3), MTHED 412(3), MTHED 427(3) (Sem: 5-8)

ADDITIONAL COURSES (9-10 credits)
MATH 435(3) or MATH 470(3); MATH 436(3) or MATH 441(3); MATH 427(3) or MATH 471(4) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits from 400-level MATH or MTHED courses (Sem: 5-8)

PHYSICS TEACHING OPTION: 65 credits[18]
This option enables the graduate to meet all of the academic requirements for the Instructional I certificate for teaching at the secondary-school level, which is issued by the Pennsylvania Department of Education. This option includes 21 credits of General Education courses.

For the B.S. degree with this option, 127-128 credits are required.

PRESCRIBED COURSES (61 credits)
CHEM 012 GN(3), CHEM 013 GN(3), CHEM 014 GN(1), CHEM 015 GN(1) (Sem: 1-4)
MATH 140 GQ(4), MATH 141 GQ(4), MATH 220 GQ(2), MATH 230(4), MATH 251(4) (Sem: 3-6)
PHYS 201 GN(4), PHYS 202 GN(4), PHYS 204 GN(4), S T S 200 GS(3) (Sem: 3-6)
PHYS 237(3), PHYS 400(3), PHYS 419(3), PHYS 457(2), SCIED 410(3), SCIED 411(3), SCIED 412(3) (Sem: 5-8)

ADDITIONAL COURSES (4 credits)
BIOL 011 GN(3), BIOL 012 GN(1); or BIOL 110 GN(4) (Sem: 3-6)

Note 1: The General Science certificate may be earned by completing 13 additional credits: ASTRO 010 GN(2), ASTRO 011 GN(1); 3 credits from GEOSC 001(3), GEOSC 002 GN(3), GEOSC 020 GN(3), or GEOSC 021 GN(3); METEO 003 GN(3); and SCIED 457(3); and 1 credit from ASTRO 296, BIOL 296, CHEM 389, GEOSC 296, METEO 296, or PHYS 296.
Note 2: A laboratory safety module and Red Cross certification in First Aid and CPR must be completed for certification. Red Cross certification may be completed through KINES 303 GHS.

RUSSIAN TEACHING OPTION: 36-48 credits[18]
This option requires credits in Russian beyond the intermediate level. In general, students are encouraged to take at least one course in Russian each semester without interruption. Students are also encouraged to participate in the study abroad program but should declare such intention as early as possible. Completion of this option leads to the Instructional I teacher certificate, which is issued by the Pennsylvania Department of Education. This option includes 9 credits of General Education courses.

For the B.S. degree with this option, 120-123 credits are required.

PRESCRIBED COURSES (36-48 credits)
Proficiency in Russian must be demonstrated by either examination or course work equivalent to the completion of 12 credits. (Sem: 3-4)
ANTH 045 GS;DF(3), LL ED 424(3), LL ED 445(3), RUS 100 GH;DF(3), RUS 204(3), RUS 214(3), RUS 221(3), RUS 304(3), RUS 305(3), RUS 360(3), RUS 430(3), RUS 460(3) (Sem: 3-8)

Note: Proficiency tests in reading, writing, speaking, and listening in Russian must be satisfied for certification.

SOCIAL STUDIES TEACHING OPTION: 51 credits[21]
This option enables the graduate to meet all of the academic requirements for the Instructional I certificate for teaching social studies in secondary schools, which is issued by the Pennsylvania Department of Education. This option includes 12 credits of General Education courses.

For the B.S. degree with this option, 122-123 credits are required.

PRESCRIBED COURSES (39 credits)
ANTH 045 GS;DF(3), HIST 010(3), HIST 012(3), HIST 020 GH(3), HIST 021 GH(3), PL SC 001GS(3), PL SC 014(3), SOC 001(3) (Sem: 1-4)
GEOG 020 GS(3), GEOG 030 GS(3), GEOG 040(3) (Sem: 3-6)
SS ED 411(3), SS ED 412(3) (Sem: 5-8)

ADDITIONAL COURSES (12 credits) (See also Note 1)
ECON 002 GS(3), ECON 004 GS(3), or ECON 014 GS(3) (Sem: 1-6)
ANTH 002 GS(3), ANTH 011 GS;GI(3), or ANTH 146 GS;GI(3) (Sem: 3-8)
Select 6 credits from one cluster with at least 3 credits at the 400 level:
ANTH 008 GS;GI(3), ANTH 440(3), HIST 178 GH;GI(3), HIST 179 GH;GI(3), PL SC 456(3), PL SC 457 (3-6);
ECON 370 GS(3), GEOG 443(3), HIST 174 GH;GI(3), HIST 175 GH;GI(3), PL SC 458(3-6), PL SC 468(3); GEOG 427(3), HIST 141 GH(3), HIST 142 GS(3), PL SC 413(3);
ECON 333 GS(3), HIST 143 GH(3), HIST 423(3), PL SC 020 GS(3), PL SC 455(3);
AAA S 200 DF(3), ANTH 012(3), GEOG 444(3), HIST 102 GH;DF(3), HIST 181 GH;GI(3), HIST 192 GH;GI(3), PL SC 454(3), PL SC 467(3), RL ST 107 GH;DF(3);
AAA S 100 GS;GI(3), GEOG 103 GS;DF(3), HIST 448(3), PL SC 474(3), RL ST 101 GH;DF(3), SOC 119 GS;GI(4), SOC 409 GS;GI(3);
ANTH 057(3), HIST 154 GH;GI(3), PSY 217 GS(3), SOC 013 GS(3), SOC 030 GS(3), SOC 110 GS;GI(3), SOC 430(3);
GEOG 128 GS;DF(3), HIST 154 GH;GI(3), HIST 156(3), L I R 136 GI(3), PL SC 125(3), SOC 015(3), SOC 446 GS(3);
ANTH 146 GS;GI(3), ECON 002 GS(3), ECON 004 GS(3), ECON 315 GS(3), S T S 047(3), S T S 101 GH(3), S T S 107 GH(3), SOC 420 or S T S 420(3), SOC 447(3);
HIST 442(3), HIST 452(3), PL SC 002(3), PL SC 125(3), PL SC 130(3), SOC 023 GS(3) (Sem: 1-6)

Note 1: Students must complete 3 credits from two different departments (total of 6 credits). These courses are linked by a common conceptual theme. The list of acceptable courses is available in the department with the College advising center or from secondary social studies education advisers.
Note 2: The Environmental Education certificate may be earned by completing 3 credits from E R M 411(3), E R M 412(3), or E R M 413W(3); R P M 325(3); AG ED 395(1-13) or R P M 430(3); SCIED 457(3); S T S 200 GS(3); BI SC 003 GN(3), BIOL 220W(4), or W F S 309(3); 12 credits of additional biological or environmental sciences; 3 credits of earth or soil sciences; ASTRO 010 GN(2) and ASTRO 011 GN(1) or METEO 003 GN(3); and 3 credits from the physical sciences.

SPANISH TEACHING OPTION: 39-51 credits[21]
This option requires credits in Spanish beyond the intermediate level. In general, students are encouraged to take at least one course in Spanish each semester without interruption. Students are also encouraged to participate in the study abroad program but should declare such intention as early as possible. Completion of this option leads to the Instructional I certificate for teaching, which is issued by the Pennsylvania Department of Education. This option includes 9 credits of General Education courses.

For the B.S. degree in this option, 120-126 credits are required.

PRESCRIBED COURSES (27-39 credits)
Proficiency in Spanish must be demonstrated by either examination or course work equivalent to the completion of 12 credits. (Sem: 3-4)
ANTH 045 GS;DF(3), SPAN 200(3), SPAN 253W(3), SPAN 354(3) (Sem: 1-4)
LL ED 424(3), LL ED 445(3), SPAN 400(3), SPAN 414(3), SPAN 440(3) (Sem: 5-8)

ADDITIONAL COURSES (12 credits)
SPAN 130 GH;DF(3) or SPAN 131 GH;DF(3); SPAN 415(3) or SPAN 418(3) (Sem: 3-8)
Select 6 credits in SPAN at the 400 level (Sem: 5-8)
Note: Proficiency tests in reading, writing, speaking, and listening in Spanish must be satisfied for certification.

[18] A grade of C or better per course is required for teacher certification.
[21] A grade of C or better per course is required for all Special Education prerequisites and teacher certification.

SECONDARY EDUCATION SOCIAL STUDIES

Capital College

The Secondary Education Social Studies major prepares students to meet the requirements to be certified for either the Citizenship Education or Social Science Instructional I Certificate as established by the Pennsylvania Department of Education. Students may select the Citizenship Education option that prepares students to teach history, government, economics, and geography, or the Social Science option that prepares students to teach psychology, sociology, and anthropology.

Students are challenged to prepare for teaching assignments at the middle and high school level, and in diverse settings characterized as rural, urban, and suburban. The art and science of teaching in secondary schools is undergoing significant transformation as new technologies, time allocation for instruction, and new instructional strategies are impacting the delivery of social studies instruction.

For a B.So.Sc. degree in Secondary Education Social Studies, a minimum of 123 credits is required.

ENTRY TO MAJOR REQUIREMENTS: Entry to the Secondary Education Social Studies major requires the students to meet or exceed the state's minimum GPA of 3.0. Students must complete, with a grade of C or better, six (6) credits of college-level mathematics (MATH or STAT prefix), three (3) credits of college-level English literature, and three (3) credits of college-level composition. (See also Teacher Education Programs.)

SELECTIVE RETENTION: Prior to the end of the first semester at Penn State Harrisburg, students will be required to submit scores of the Praxis I examinations in reading, writing, and mathematics.

GENERAL EDUCATION: 45 credits
(21 of these credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 9 credits

REQUIREMENTS FOR THE MAJOR: 90 credits
(This include 21 credits of General Education courses: 6 credits of GH courses, 3 credits of GN courses, 6 credits of GS courses, 6 credits of GQ courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 57 credits

PRESCRIBED COURSES (48 credits)[1]
BI SC 003 GN(3), ECON 002 GS(3), ECON 004 GS(3), HIST 001 GH(3), HIST 020 GH(3), HIST 021 GH(3), PSY 002 GS(3), SOC 001 GS(3) (Sem: 1-4)
EDUC 313(2), EDUC 314(3), EDUC 315 GI(3), EDUC 415(3), EDUC 435(1), EDUC 490(12) (Sem: 5-8)

ADDITIONAL COURSES (6 credits)
Select 6 credits from the following:
MATH 017 GQ(3), MATH 018 GQ(3), MATH 021 GQ(3), MATH 022 GQ(3), MATH 026 GQ(3), MATH 030 GQ(3), MATH 035 GQ(3), MATH 036 GQ(3), MATH 040 GQ(4), MATH 200 GQ(3), or MATH 220 GQ(3), STAT 100 GQ(3), STAT 200 GQ(4) (Sem: 1-4)

SUPPORTING COURSES AND RELATED AREAS (3 credits)
Select 3 credits of literature courses from approved department list (Sem: 1-4)

REQUIREMENTS FOR THE OPTION: 33 credits

CITIZENSHIP EDUCATION OPTION: 33 credits

PRESCRIBED COURSES (18 credits)
I HUM 311(3), C HIS 320 DF(3), PUBPL 420(3), GEOG 040 GS;GI(3), GEOG 128 GS;DF(3), PSYC 402(3) (Sem: 5-8)

ADDITIONAL COURSES (3 credits)
PUBPL 301(3) or PL SC 001GS(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 3 credits of American studies from approved department list (Sem: 5-8)
Select 3 credits of history from approved department list (Sem: 5-8)
Select 3 credits of anthropology from approved department list (Sem: 5-8)
Select 3 credits of minority studies from approved department list (Sem: 5-8)

SOCIAL SCIENCE OPTION: 33 credits

PRESCRIBED COURSES (15 credits)
ANTH 001 GS;GI(3), ANTH 045 GS;GI(3), SOC 005 GS(3), SOCIO 372(3), SOCIO 440(3) (Sem: 5-8)

ADDITIONAL COURSES (9 credits)
Select 3 credits from PSYC 403(3), PSYC 405(3), PSYC 406(3) (Sem: 5-8)
Select 3 credits from PSYC 402(3), PSYC 415(3), PSYC 482(3) (Sem: 5-8)
Select 3 credits from PSYC 424(3), PSYC 425(3), PSYC 427(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 3 credits of history from approved department list (Sem: 5-8)
Select 3 credits of minority studies from approved department list (Sem: 5-8)
Select 3 credits of non-western studies from approved department list (Sem: 5-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

SOCIOLOGY

Capital College

This major is intended for students who want a strong sociology background in preparation for work in government or social agencies or who are interested in graduate work in sociology. In addition to developing analytical and critical thinking skills, students will gain an understanding of various substantive areas of the field including social structure and institutions, social change, social class, gender, and race and ethnicity. Sociologists are employed in such diverse fields as social and human service agencies, nonprofit and advocacy organizations, research and policy work, telecommunications, human resource management, and college teaching. This major is appropriate for work in any environment where an understanding of social structures and social dynamics is required.

For a B.S. degree in Sociology, a minimum of 122 credits is required.

ENTRY TO MAJOR REQUIREMENTS: Entry to the Sociology major requires 2.00 or higher cumulative grade-point average.

GENERAL EDUCATION: 45 credits
(6 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 24 credits

REQUIREMENTS FOR THE MAJOR: 59 credits[1]
(This includes 6 credits of General Education course requirements: 3 credits of GWS courses and 3 credits of GS courses.)

PRESCRIBED COURSES (20 credits)
ENGL 202A GWS(3) (Sem: 1-4)
SCLSC 480W(4), SCLSC 481(4), SCLSC 492(3), SOCIO 384(3), SOCIO 488(3) (Sem: 5-8)

ADDITIONAL COURSES (27 credits)
Select 3 credits from SOC 001 GS(3), R SOC 011 GS(3) (Sem: 1-4)
Select 9 credits from SOCIO 404(3), SOCIO 463(3), SOCIO 470(3), SOC 416(3), SOC 429(3), SOC 444(3), SOC 455(3), SOC 456(3) (Sem: 5-8)
Select 9 credits from SOCIO 372(3), SOCIO 430(3), SOCIO 440(3), SOCIO 471(3), SOCIO 472(3), SOCIO 476(3) (Sem: 5-8)
Select 6 credits from AFRAS 301 GI(3), AFRAS 310 GI(3), AFRAS 412 GI(3), BE SC 464 GI(3), SOCIO 462 DF(3), WOMST 315(3), WOMST 415(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 6 credits (minimum of 3 credits at the 400 level) in consultation with adviser from AFRAS, BE SC, SOC, SOCIO (Sem: 5-8)
Select 6 credits (minimum of 3 credits at the 400 level) in consultation with adviser from AMSTD, C ART, C HIS, C MUS, CRIMJ, ENGL, ENLSH, HCOMM, I HUM, LIT, PSY, PSYC, PL SC, PUBPL, THTRE, WMNST, WOMST (Sem: 5-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

SOCIOLOGY, B.A.

College of the Liberal Arts

The major provides graduates with a sociological perspective on human behavior informed by exposure to different substantive areas of the field; an understanding of the structure of American society, its internal diversity, and its international context; an understanding of basic principles of the scientific method, statistics, research design, computer use, logic and critical thinking, and how these apply to the study of human behavior; and experience in posing sociological questions and collecting and analyzing data to bear on those questions. Graduates have the background to seek employment in a variety of public and private sector jobs, to pursue graduate study in sociology or related areas, or to enter professional schools in social work, law, business, or health fields.

Students may choose either a Bachelor of Arts or a Bachelor of Science degree program. The B.A. degree in Sociology is a classic liberal arts degree. The B.S. degree is intended for students with a strong interest in quantitative skills. Students completing the B.S. degree have additional training in mathematics and other social science disciplines.

Opportunities to work as departmental teaching and research assistants are available. Students are encouraged to participate in study abroad and/or internship experiences while enrolled in either the B.A. or B.S. sociology majors.

Graduates of this program have found positions in social research, social service agencies, government and business research and planning offices, other business positions (especially sales and marketing), or have entered graduate school in sociology, social work, policy analysis, or law school.

For the B.A. and B.S. degrees in Sociology, a minimum of 123 credits is required. Either degree may be combined with a minor such as Business/Liberal Arts, Human Development and Family Studies, or Information Systems and Statistical Analysis, among others.

GENERAL EDUCATION: 45 credits
(4 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)
ELECTIVES: 20 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 38 credits[1]
(This includes 4 credits of General Education GQ courses.)

PRESCRIBED COURSES (23 credits)
SOC 001 GS(3), STAT 200 GQ(4), L A 283(3) (Sem: 1-6)
SOC 207(3) (Sem: 3-6)
SOC 405(3), SOC 470(4) (Sem: 5-8)
SOC 400W(3) (Sem: 7-8)

ADDITIONAL COURSES (3 credits)
SOC 003 GS(3) or SOC 023 GS(3) (Sem: 1-6)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 12 credits in sociology, at least 9 credits at the 400 level (Sem: 1-8)

SOCIOLOGY, B.S.

College of the Liberal Arts

Students may hoose either a Bachelor of Arts or a Bachelor of Science degree program. The B.A. degree program provides a basic orientation to the field as a whole, study of its development and principles, training in methodology and study in depth of a major area of the discipline. It provides knowledge that is useful in a career in varied work settings as well as providing the foundation needed for graduate study in sociology of related fields.

For the B.S. degree in Sociology, a minimum of 123 credits is required.

GENERAL EDUCATION: 45 credits
(6 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 21-23 credits

REQUIREMENTS FOR THE MAJOR: 61-63 credits[1]
(This includes 6 credits of General Education GQ courses.)

PRESCRIBED COURSES (10 credits)
SOC 001 GS(3), SOC 007(3) (Sem: 1-8)
MATH 441(3) (Sem: 5-6)
STAT 480(1) (Sem: 5-8)

ADDITIONAL COURSES (6-8 credits)
MATH 110 GQ(4), MATH 111 GQ(2); or MATH 140 GQ(4), MATH 141 GQ(4) (Sem: 1-4)

SUPPORTING COURSES AND RELATED AREAS (45 credits)
Select 24 credits in sociology, 15 credits of which must be in an area of specialization chosen in consultation with a faculty adviser (15 credits must be at the 400 level) (Sem: 1-8)
Select 18 credits in social sciences, 9 credits in each of two fields of the social sciences other than sociology (at least 9 credits must be at the 400 level) (Sem: 3-8)
Select 3 credits in statistics at the 300 level or above (Sem: 5-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

SOFTWARE ENGINEERING

Penn State Erie, The Behrend College

This major provides students with a strong foundation in software engineering through combination of classroom study, software development experience, and design projects. Design, analysis, verification, and maintenance of software systems are stressed. Built upon a core of science and mathematics courses, this major has the objective of educating graduates to be problem solvers. Students acquire the ability to work as members of a team toward successful attainment of a common goal, preparing them for work in industry or further study in graduate school. In addition, written and oral communication skills are developed from an early stage, culminating in a senior design project that stresses communication as well as engineering content.

In addition to completing a broad-based science core in mathematics, chemistry, and physics, students pursue their interest in software engineering by studying principles in computer programming, object-oriented design, software design, software verification, information systems, operating systems, and data communications. The program has a capstone software design project that requires students to work together on teams to design, plan, manage, and implement a software design project.

ENTRANCE REQUIREMENT: In addition to the Carnegie unit and minimum GPA requirements described by University policies, all students applying for entrance to any of the engineering majors at The Behrend College must have at least a 2.0 cumulative GPA by the end of the semester prior to applying for entrance to the major and have completed, with a minimum grade of C: CHEM 012 GN(3), MATH 140 GQ(4), MATH 141 GQ(4), and PHYSICS 211 GN(4). These courses must be completed by the end of the semester during which the admission to major process is carried out.

For the B.S. degree in Software Engineering, a minimum of 127 credits is required. A student enrolled in this major must earn a grade of C or better in each 300- and 400-level course in the major.

GENERAL EDUCATION: 45 credits
(21 of the 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 1 credit

REQUIREMENTS FOR THE MAJOR: 102 credits
(This includes 21 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GWS courses; 3 credits of GS courses.)

PRESCRIBED COURSES (87 credits)
CHEM 012 GN(3), CHEM 014 GN(1), CSE 103 GQ(4), CSE 120(3)[1] (Sem: 1-2)
MATH 140 GQ(4)[1], MATH 141 GQ(4)[1], MATH 220 GQ(2), MATH 250(3), PHYS 211 GN(4), PHYS 212 GN(4) (Sem: 1-4)
CENBD 360(3)[1], CSE 260(3), CSE 271(3)[1], CSE 275(1), M I S 204(2), MISBD 336(3), ENGL 202C GWS(3) Sem: (3-4)
CMPBD 410(3)[1], CMPBD 440(3)[1], STABD 303(3)[1] Sem: (5-6)
CENBD 421(3)[1], CENBD 451W(3)[1], CENBD 455(3)[1], CENBD 461(3)[1], CENBD 462(3)[1], CENBD 463(3)[1], CENBD 465(3)[1], CENBD 482(1)[1], CENBD 483(3)[1] Sem: (5-8)
MANGT 300(3) (Sem: 8)

ADDITIONAL COURSES (6-7 credits)
ECON 002 GS(3) or ECON 004 GS(3) (Sem: 3-4)
E E 210(4) or E E 220(3) (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (8-9 credits)
Select 8-9 credits of technical elective courses from school-approved list. (Sem: 6-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

SPANISH, B.A.

College of the Liberal Arts
This major is designed to develop basic skills in speaking, understanding, reading, and writing Spanish. In addition, the program aims to acquaint students with the literature and civilization of the Hispanic world. Enough flexibility is provided to permit a degree of concentration in either Hispanic literature or linguistics. Specialized courses are offered in translation techniques and in the use of Spanish for social services. Courses taken in the University's Education Abroad Program in Spain may be applied to the major. In conjunction with the College of Education, students may take work leading to certification as Spanish teachers in the secondary or elementary schools.

An integral part of the major is the inclusion of two courses (8 credits) in another Romance language (Italian, Portuguese, or French) or Latin. Students are encouraged to use these courses as a basis for acquiring greater proficiency in a second language.

Combined with course work in business, social welfare, or bilingual education, the B.A. in Spanish can facilitate entry into a number of professional areas. In addition, it provides the traditional foundation for advanced degree work required for such careers as college teaching and government service.

For the B.A. degree in Spanish, a minimum of 123 credits is required.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selections)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or BACHELOR OF ARTS DEGREE REQUIREMENTS course selections)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 18 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 36 credits[1]

PRESCRIBED COURSES (15 credits)
SPAN 100(3) (Sem: 1-6)
SPAN 200(3) (Sem: 2-6)
SPAN 253(3), SPAN 300W(3) (Sem: 3-6)
SPAN 414(3) (Sem: 3-8)

ADDITIONAL COURSES (9 credits)
SPAN 210(3) or SPAN 220(3) (Sem: 3-6)
SPAN 353(3) or SPAN 354 (3) (Sem: 3-6)
SPAN 355(3) or SPAN 356(3) (Sem: 3-8)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 12 credits from groups a and b. You must select at least 3 credits in each group.
a. SPAN 412, SPAN 145, SPAN 418, SPAN 420, SPAN 497 (linguistics) (Sem: 5-8)
b. SPAN 439, SPAN 472, SPAN 476, SPAN 497 (literature) (Sem: 5-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

SPANISH, B.S.

College of the Liberal Arts

This major encourages students to prepare for careers in which fluency in Spanish can be combined with training in other academic disciplines.

For the B.S. degree in Spanish, a minimum of 123 credits is required.

GENERAL EDUCATION: 45 credits
(0-13 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 18 credits

REQUIREMENTS FOR THE MAJOR: 60-74 credits[1]
(This includes 0-13 credits of General Education courses: 0-6 credits of GS courses, 0-3 credits of GWS courses, 0-4 credits of GQ courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 30 credits

PRESCRIBED COURSES (21 credits)
SPAN 100(3) (Sem: 1-6)
SPAN 200(3) (Sem: 2-6)
SPAN 253(3), SPAN 300W(3), SPAN 305(3) (Sem: 3-6)
SPAN 412(3), SPAN 414(3) (Sem: 5-8)

ADDITIONAL COURSES (9 credits)
SPAN 210(3) or SPAN 220(3) (Sem: 3-6)
SPAN 353(3) or SPAN 354(3) (Sem: 3-6)
SPAN 355(3) or SPAN 356(3) (Sem: 3-8)

REQUIREMENTS FOR THE OPTION: 30-44 credits

APPLIED SPANISH OPTION: 30 credits
This option is designed to develop basic skills in Spanish (speaking, understanding, reading, writing) and to provide Spanish majors with concentration in a professional area where a command of Spanish can be particularly relevant and useful.

ADDITIONAL COURSES (9 credits)
Select 9 credits from SPAN 410(3), SPAN 415(3), SPAN 418(3), SPAN 420(3), SPAN 439(3), SPAN 472(3), SPAN 476(3), or SPAN 497(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (21 credits)
Select 21 credits in consultation with the adviser in related areas such as social services, the teaching of English as a second language or in another professional area where competency in Spanish is desirable. At least 6 credits of such courses must be at the 400 level. (Sem: 1-8)

BUSINESS OPTION: 43-44 credits
This option is designed to develop basic skills in Spanish (speaking, understanding, reading, writing) and to acquaint students with a number of fields essential to business, especially in the international area. Courses in translation techniques, Spanish civilization, and Ibero-American civilization are an integral part of the option. Students are eligible to participate in the University's Education Abroad Programs in Salamanca, Spain; San Germán, Puerto Rico; Puebla, Mexico; and in the International Business Program in San José, Costa Rica.

PRESCRIBED COURSES (34 credits)
ACCTG 211(4), ECON 002 GS(3), ECON 004 GS(3), ENGL 202D GWS(3), FIN 100(3), MKTG 221(3) (Sem: 3-6)
ECON 333 GS(3), I B 303(3), I B 403(3), MGMT 100W(3), SPAN 420(3) (Sem: 3-8)

ADDITIONAL COURSES (9-10 credits)
Select 3 credits from MS&IS 201(3) or STAT 200 GQ(4) (Sem: 3-8)
Select 6 credits from SPAN 410(3), SPAN 415(3), SPAN 418(3), SPAN 439(3), SPAN 472(3), SPAN 476(3), SPAN 497(3) (Sem: 5-8)

Integrated Spanish B.S. and Industrial Relations and Human Resources M.S. Degree Programs (SPIRHR)

The integrated Spanish B.S. and IRHR M.S. is a five-year program designed for highly qualified and motivated students seeking employment within a culturally diverse workplace. Students will develop basic skills in speaking, understanding, reading, and writing Spanish. Students will gain familiarity with Hispanic cultures through literature and the University's Education Abroad Program, if they choose to have that experience. Students also will learn about (1) the roles of employers, employees, employee organizations, and public policy makers play in the employment relationship, (2) the complex personal and organizational issues inherent in the employment relationship, and (3) how to systematically analyze those complex issues and evaluate research relevant to those analyses.

For the B. S./M. S. degree in Integrated Spanish B.S. and Industrial Relations and Human Resources M.S., a minimum of 154 credits is required. Twelve graduate-level credits can apply to both undergraduate and graduate degrees; six of these must be at the 500 level. Students can complete the B.S. in Spanish and not advance to the M.S. IRHR degree if they desire.

BACHELOR OF SCIENCE
GENERAL EDUCATION: 45 credits
(10 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin).

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 18 credits

REQUIREMENTS FOR THE MAJOR: 101 credits
(This includes 10 credits of General Education courses: 6 credits of GS courses; 4 credits of GQ courses.)

PRESCRIBED COURSES (27 credits)
[Some courses in this category have prerequisites that are not included in the major]
SPAN 100(3), SPAN 120(3), SPAN 200(3), SPAN 253W(3), SPAN 305(3) (Sem: 1-6)
SPAN 400(3), SPAN 410(3), SPAN 412(3), SPAN 414(3) (Sem: 5-8)

ADDITIONAL COURSES (12 credits)
SPAN 210(3) or SPAN 220(3), SPAN 353(3) or SPAN 354(3) (Sem: 3-6)
SPAN 472(3) or SPAN 476(3) (Sem: 5-8)
Select 3 credits of SPAN 415(3), SPAN 418(3), SPAN 420(3), SPAN 439(3), SPAN 490(3), SPAN 491(3), or SPAN 497(1-9) (Sem: 5-8)

LABOR AND INDUSTRIAL RELATIONS (32 credits)
[Prescribed undergraduate credits in Labor and Industrial Relations option]
ECON 002 GS(3), LIR 100 GS(3), LIR 101(3), LIR 212(4), LIR 400(3),
LIR 414W(3), LIR 458W(3), STAT 200 GQ(4) (Sem: 1-6)
IRHR 501(3), IRHR 512(3) (Sem: 7-8)

MASTER OF SCIENCE
INDUSTRIAL RELATIONS/HUMAN RESOURCES M.S. (30 credits)
IRHR credits to be selected from the following in consultation with an IRHR adviser:
IRHR 500, IRHR 502, IRHR 504, IRHR 505, IRHR 513, IRHR 516, IRHR 535, IRHR 536, IRHR 595*, IRHR 596*, IRHR 597, IRHR 599 (*only 3 credits of 595 and 596 may be used to satisfy this requirement)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

SPECIAL EDUCATION

College of Education

The emphasis throughout the Special Education program is upon a broad clinical teaching model. Course work and practicum experiences focus upon the diagnosis and management of a wide range and degree of educational and behavioral problems of students with disabilities between the ages of 3 and 21. A core of Special Education courses aimed at general skill development in the areas of diagnosis, prescription, development of materials and teaching strategies, implementation, and evaluation is required of all students.

This major focuses on teaching principles and methodologies, classroom and behavioral management, and the development of teaching materials for children and youths with mild, moderate, and severe disabilities. This program helps prepare special education teachers to meet the needs of students enrolled in elementary and secondary public school special education programs.

The executive vice president and provost of the University has approved administrative enrollment controls for this major. The number of students admitted each year to this major is limited. Additional information about applying for this major is available in the dean's office in the College of Education.

Upon successful completion of the major outlined below, students become eligible for the Pennsylvania Level I Certificate in Teaching the Mentally and/or Physically Handicapped.

For the B.S. degree in Special Education, 123 credits are required. (See also Teacher Education Programs.)

GENERAL EDUCATION: 45 credits
(12-15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selections)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selections)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 3 credits[19]

REQUIREMENTS FOR THE MAJOR: 87-90 credits[21]
(This includes 12-15 credits of General Education courses: 6 credits of GQ courses; 6 credits of GS courses; and 0-3 credits of GHA courses.)

PRESCRIBED COURSES (81 credits)
EDPSY 014(3), EDPSY 101 GQ(3), EDTHP 115(3), HD FS 129 GS(3), MATH 200 GQ(3), PSY 002 GS(3), PSY 213 GS(3) (Sem: 1-4)
KINES 402(3), SPLED 425(3), SPLED 395W(3), SPLED 401(4), SPLED 404(3), SPLED 411(3), SPLED 412(4), SPLED 454(4), SPLED 495E(3) (Sem: 5-6)
INSYS 400(2), SPLED 402(3), SPLED 409(6), SPLED 495F(15), SPLED 495G(4) (Sem: 7-8)

ADDITIONAL COURSES (0-3 credits)
Red Cross Certification in First Aid and CPR(0) or KINES 303 GHS(3) or NURS 203 GHA(3) (Sem: 1-8)
SUPPORTING COURSES AND RELATED AREAS (6 credits)[19]
Select 3 credits in EDTHP at the 400 level (Sem: 5-8)
Select 3 credits in consultation with SPLED adviser (Sem: 5-8)
[19] Students may apply 3 credits of ROTC.
[21] A grade of C or better per course is required for all Special Education prerequisites and teacher certification.

STATISTICS

Eberly College of Science

This major helps prepare students with interests in mathematics, computation, and the quantitative aspects of science for careers in industry and government as statistical analysts, or for further graduate training in statistics. Research divisions in the pharmaceutical industry, quality control, and quality engineering divisions in manufacturing companies, clinical research units, corporate planning and analysis units, and other data-intensive positions require persons with training in mathematics, computation, database management, and statistical analysis, which this major will provide. The major includes four options: a Biostatistics option, a Graduate Study option for students planning to go to graduate school in statistics, a Statistics and Computing option, and an Applied Statistics option for students interested in a cross-disciplinary program.

The Biostatistics option will give students interested in biological applications of statistics the appropriate training for pursuing their interests. Such training would be useful for students planning careers with pharmaceutical companies, research hospitals and many other fields in which biological data is analyzed.

In order to be eligible for entrance into the Statistics major, a student must have: 1) Attained at least a 2.00 cumulative grade point average. 2) Completed MATH 140 GQ(4) and MATH 141 GQ(4); and earned a grade of C or better in each of these courses.

For the B.S. degree in Statistics, a minimum of 120 credits is required.

GENERAL EDUCATION: 45 credits
(6-15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in GENERAL EDUCATION course selection or REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 1-2 credits

REQUIREMENTS FOR THE MAJOR: 80-88 credits
(This includes 6-15 credits of General Education: 0-9 credits of GN courses; 6 credits of GQ courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 46-49 credits

PRESCRIBED COURSES (35 credits)
MATH 140 GQ(4)[1], MATH 141 GQ(4)[1] (Sem: 1-2)
MATH 220 GQ(2)[1], STAT 220(3) (Sem: 3-4)
STAT 414(3)[1], STAT 415(3)[1], STAT 416(3)[1] (Sem: 5-6)
STAT 460(3)[1], STAT 462(3)[1], STAT 464(3)[1], STAT 470(3)[1], STAT 480(1)[1] (Sem: 5-8)

ADDITIONAL COURSES (11-14 credits)
CSE 103 GQ(4), CMPSC 201C GQ(3), or CMPSC 201F GQ(3) (Sem: 1-4)
MATH 230(4)[1] or MATH 231(2)[1] (Sem: 3-4)
CSE 451(3) or CSE 455(3) (Sem: 5-8)
MATH 484(3) or I E 405(3) (Sem: 5-8)

REQUIREMENTS FOR THE OPTION: 31-42 credits

BIOSTATISTICS OPTION: 36-42 credits

PRESCRIBED COURSES (8 credits)
BIOL 110 GN(4), CHEM 012 GN(3), CHEM 014 GN(1) (Sem: 1-3)

ADDITIONAL COURSES (14 credits)
Select 8 credits from BIOL 220W GN(4), BIOL 222(3) and BIOL 223(1), BIOL 230W GN(4), BIOL 240W GN(4) (Sem: 3-4)
Select 6 credits from 400-level BIOL courses (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (17-20 credits)
Select 17-20 credits from department list (Sem: 1-8)

GRADUATE STUDY OPTION: 31-34 credits

PRESCRIBED COURSES (12 credits)
MATH 312(3), MATH 403(3), MATH 404(3) (Sem: 5-8)
CSE 456(3) (Sem: 7-8)

ADDITIONAL COURSES (6 credits)
Select 6 credits from MATH 310(3), MATH 421(3), MATH 426(3), MATH 429(3), MATH 441(3), MATH 457(3), MATH 468(3), MATH 485(3), MATH 486(3) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (13-16 credits)
Select 13-16 credits from department list (Sem: 1-8)

Note: Students completing the Graduate Study option will have earned a minor in mathematics in addition to a B.S. in Statistics.

STATISTICS AND COMPUTING OPTION: 31-34 credits

PRESCRIBED COURSES (17 credits)
CSE 120(3), CSE 260(3), CSE 312(3) (Sem: 3-6)
CSE 441W(3), CSE 465(3) (Sem: 5-8)

ADDITIONAL COURSES (3 credits)
Select 3 credits from CSE 418(3), CSE 456(3), CSE 460(3), or CSE 481(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (11-14 credits)
Select 11-14 credits from department list (Sem: 1-8)

APPLIED STATISTICS OPTION: 31-34 credits

SUPPORTING COURSES AND RELATED AREAS (31-34 credits)
(A maximum of 12 credits of Independent Study [296, 496] may be applied toward credits for graduation.)

Select 31-34 credits from department list, including a minor in a supporting field (Sem: 1-8) (If a student wants to work in a supporting area that does not have a minor, he or she can propose a list of six appropriate courses and petition the statistics department for approval. It is the student's responsibility to justify the appropriateness of the proposed list.)

Integrated B.S. in Statistics and Master of Applied Statistics (M.A.S.)

The Integrated Undergraduate-Graduate (IUG) degree with B.S. in Statistics and Master of Applied Statistics (M.A.S.) is designed to be completed in five years. This integrated degree will enable a select number of highly qualified and career-oriented students to obtain training in statistics focused on developing data analysis skills and exploration of core areas of applied statistics at the undergraduate and graduate levels. The M.A.S. degree is a professional master's degree that emphasizes applications and does not provide as much training in the mathematical and statistical theory. The degree prepares students with interests in mathematics, computation, and the quantitative aspects of science for careers in industry and government as statistical analysts. Research divisions in the pharmaceutical industry, quality control and quality engineering divisions in manufacturing companies, clinical research units, corporate planning and research units, and other data-intensive positions require persons with training in mathematics, computation, database management, and statistical analysis, which this program will provide.

APPLICATION PROCESS: The number of openings in the integrated B.S./M.A.S. program is limited. Admission will be based on specific criteria and the recommendation of faculty. Applicants to the integrated program:

1. Must be enrolled in the Statistics B.S. program.
2. Must have completed at least 60 credits of the undergraduate degree program including the two courses: STAT 414 and STAT 415, and the students must apply to the program prior to completing 110 credits.
3. Must submit a transcript and a statement of purpose.
4. Must present a department-approved plan of study in the application process in consultation with the M.A.S. program director.
5. Must be recommended by the chair of the department's undergraduate program committee.
6. Must be accepted into the M.A.S. program in Statistics.

For the IUG B.S./M.A.S. degree, 120 credits are required for the B.S. and 30 credits for the M.A.S. The following twelve graduate-level credits (number of credits in parentheses) can apply to both B.S. and M.A.S. degrees; six of these are at the 500 level: STAT 414 (3) Introduction to Probability Theory; STAT 415 (3) Introduction to Mathematical Statistics; STAT 501 (3) Regression Methods; STAT 502 (3) Analysis of Variance and Design of Experiments.

Assuming all requirements for the B.S. are completed, students in the program can complete the B.S. degree and not advance to the M.A.S. degree if they desire.

Degree Requirements

IUG STATISTICS B.S. PRESCRIBED STATISTICS COURSES (25 credits)
STAT 220 (3) Basic Statistics
STAT 414 (3) Introduction to Probability Theory
STAT 415 (3) Introduction to Mathematical Statistics
STAT 416 (3) Stochastic Modeling
STAT 464 (3) Applied Nonparametric Statistics
STAT 470W (3) Problem Solving and Communication in Applied Statistics
STAT 480 (1) Introduction to Statistical Program Packages
STAT 501 (3) Regression Methods
STAT 502 (3) Analysis of Variance and Design of Experiments
Note that students in IUG Statistics B.S. take STAT 501 and 502 instead of STAT 460 and 462 for the regular Statistics B.S.

IUG STATISTICS M.A.S. REQUIREMENT (30 credits)
STAT 414 (3) Introduction to Probability Theory
STAT 415 (3) Introduction to Mathematical Statistics
STAT 501 (3) Regression Methods
STAT 502 (3) Analysis of Variance and Design of Experiments
STAT 580* (3) Statistical Consulting Practicum
Electives (15) Choose from STAT 503-510 and the departmental list of additional courses for the M.A.S. program with the approval of the adviser.
*For all students in the M.A.S program, the STAT 580 course will have a comprehensive written project report required as part of the course, which serves as the culminating experience.
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

STRUCTURAL DESIGN AND CONSTRUCTION ENGINEERING TECHNOLOGY

Capital College

NOTE: Changes were being made to the major at press time. See www.psu.edu/bulletins/bluebook.

The Structural Design and Construction Engineering Technology (SDCET) program provides the student with a well-rounded basic education in structural and construction principles. General engineering concepts, the use of construction methods, techniques in estimating and scheduling, aspects of construction management, design principles in steel and concrete relating to structural as well as foundation systems, applied computer methods, and awareness of integrated application of the project are included in the curriculum.

For a B.S. degree in Structural Design and Construction Engineering Technology, a minimum of 125 credits is required.

ENTRY TO MAJOR REQUIREMENTS: Entry to the Structural Design and Construction Engineering Technology major requires a 2.00 or higher cumulative grade-point average.

CHANGE-OF-ASSIGNMENT/RE-ENROLLMENT: Students should request a change-of-assignment to Penn State Harrisburg during their final semester, to be effective for the next semester of enrollment.

Associate degree students should file a re-enrollment form during the final semester of their associate degree. Students re-enrolling from an associate degree into the bachelor's degree should run a degree audit from eLion, using the SDCET major code, to determine their curriculum requirements.

GENERAL EDUCATION: 45 credits
(13-21 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 0-1 credits

REQUIREMENTS FOR THE MAJOR: 100-114 credits
(This includes 13-21 credits of General Education courses: 7-9 credits of GN courses; 0-6 credits of GQ courses; 3 credits of GS courses; 3 credits of GWS courses.)

PRESCRIBED COURSES (48 credits)
CHEM 012 GN(3), CHEM 014 GN(1) (Sem: 2-4)
ENGL 202C GWS(3) (Sem: 3-4)
SSET 295(1) (Sem: 3)
C E T 242(2), C E T 243(2) (Sem: 5-6)
C E T 332(3)[1], C E T 430(3)[1], C E T 431(3)[1], C E T 432(3)[1], C E T 434(3), C E T 435(3)[1], C E T 438(3), C E T 452(3)[1], C E T 454(3), C E T 458(4) (Sem: 5-8)
C ENG 454(3) (Sem: 7-8)
C E 448W(3) (Sem: 7-8)

ADDITIONAL COURSES (52-66 credits)
Select 2-3 credits from: EG T 101(1) and EG T 102(1) or ED&G 100(3) (Sem: 1-2)
Select 3-4 credits from: PHYS 150 GN(3), PHYS 211 GN(4), PHYS 250 GN(4) (Sem: 1-2)
Select 3-4 credits from: PHYS 151(3), PHYS 212 GN(4), PHYS 251 GN(4), CPHYS 251(4) (Sem: 1-2)
Select 3-6 credits from: C E T 308(3) or AE T 101(3) and AE T 102(3) (Sem: 1-6)
Select 2-3 credits from: SUR 111(3), C E 209(2), C E T 201(3), C ENG 201(3) (Sem: 2-4)
Select 3-5 credits from: E T 200(3) or AE T 206(2) and AE T 207(3) (Sem: 2-5)
Select 3 credits from: E T 322(3), E MCH 013(3), MCH T 213(3) (Sem: 2-5)
Select 1 credit from: E T 323(1) or MCH T 214(1) (Sem: 2-5)
Select 2-3 credits from: E T 302(2) or E MCH 012(3) (Sem: 2-6)
Select 3-4 credits from: CMPSC 101 GQ(3), CMPSC 110(3), CMPSC 201C GQ(3), CMPSC 201F GQ(3), CSE 103 GQ(4) (Sem: 3-4)
Select 3 credits from: ECON 002 GS(3), ECON 004 GS(3), ECON 014 GS(3) (Sem: 3-4)
Select 4 credits from: MATH 140 GQ(4) or CMATH 220(4) (Sem: 3-6)
Select 3-4 credits from: MATH 141 GQ(4), CMATH 221(4), STAT 200 GQ(4), MA SC 422(3) (Sem: 3-6)
Select 3-4 credits from: B LAW 243(3), B A 243(4), MNGMT 310(3), MNGMT 463(3), ACCTG 151(3), ACCTG 211(4), MRKT 370(3), MGMT 321(3), MGMT 100W(3) (Sem: 3-8)
Select 6 credits from: C E T 436(3), C E T 437(3), ENVE 451(3), E T 495(3), M E T 311(3), M E T 402(3), M E T 433(3), EE T 101(3) or E E T 320(4), B LAW 243(3), B A 243(4), MNGMT 310(3), MNGMT 463(3), ACCTG 151(3), ACCTG 211(4), MRKT 370(3), MGMT 321(3), MGMT 100W(3), SSET 495(1) (Sem: 3-8)
Select 3 credits from: E MCH 011(3), MCH T 111(3)[1] (Sem: 4-6)
Select 3 credits from: CE T 261(3), C E T 361(3), C ENG 361(3) (Sem: 4-7)
Select 2-3 credits from: I E T 302(2) or C ENG 302(3) (Sem: 5-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

SUPPLY CHAIN AND INFORMATION SYSTEMS

Smeal College of Business

The SC&IS major concentrates on the management of value-creating supply chain networks that modern business enterprises use to acquire, produce, and deliver goods and services all over the world and on information technology as the key enabler of supply chain integration. Students learn how to analyze and design supply chains and manage core business processes including (1) sourcing and procuring raw materials, (2) manufacturing, and (3) planning and fulfilling customer demand. Students also develop knowledge, skills, and abilities in the information systems area, including information processing, databases, information systems design and analysis, and supply chain technologies.

Graduates are well-prepared for careers in the supply chain and information systems area in both industry and government, including manufacturing, service, technology, and merchandising companies, third-party logistics providers, transport system enterprises, consulting firms, and government agencies. More information about the broad range of career opportunities is available at www.smeal.psu/scis/recruit.html.

For the B.S. degree in Supply Chain and Information Systems, a minimum of 120 credits is required (at least 15 credits must be taken at the 400 level).

GENERAL EDUCATION: 45 credits
(15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 12-14 credits

REQUIREMENTS FOR THE MAJOR: 76-78 credits
(This includes 15 credits of General Education courses: 3 credits of GWS courses; 6 credits of GQ courses; and 6 credits of GA, GH or GS courses.)

PRESCRIBED COURSES (45 credits)
ACCTG 211(4), CMPSC 203 GQ(4), ECON 002 GS(3), ECON 004 GS(3) (Sem: 1-4)
B A 301(2), B A 302(2)[1], B A 303(2), B A 304(2), B A 411(3), SC&IS 404(3)[1], SC&IS 405(3)[1], SC&IS 406W(3)[1], ENGL 202D GWS(3) (Sem: 5-6)
SC&IS 421(3)[1], SC&IS 423(3)[1], SC&IS 450(3)[1] (Sem: 7-8)

ADDITIONAL COURSES (14-16 credits)
MATH 110 GQ(4) or MATH 140 GQ(4) (Sem: 1-2)
MS&IS 200(4) or STAT 200(4) (Sem: 1-2)
M I S 204(2) or IST 110(4) (Sem: 3-4)
B A 243(4) or B A 241(2) and B A 242(2) (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (16 credits)
Select 4 credits: Attainment of 12th-credit-level proficiency in a single foreign language. Proficiency must be demonstrated by either examination or course work (Sem: 1-4)
Select 6 credits of Global Awareness and Understanding from approved course list (credits must be taken in GA, GH, or GS) (Sem: 1-8)
Select 6 credits of supporting course work (see department list) (Sem: 5-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

SURVEYING

Commonwealth College; College of Engineering

This major provides the basic undergraduate education required for private and public service in the surveying profession. Particular emphasis is placed on fundamental surveying principles required in all areas of surveying. A basic introduction is provided in the main subdivisions of surveying, including cadastral surveying, geodesy, photogrammetry, adjustments, remote sensing, geographic information systems, and land development.

For the B.S. degree in Surveying, a minimum of 130 credits is required. This baccalaureate program in Surveying is accredited by the Applied Science Accreditation Commission of ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202-4012, telephone: 410-347-7700, or www.abet.org.

GENERAL EDUCATION: 45 credits
(24 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 109 credits
(This includes 24 credits of General Education courses: 6 credits of GWS courses; 6 credits of GQ courses; 9 credits of GN courses; 3 credits of GS courses.)

PRESCRIBED COURSES (72 credits)
MATH 140 GQ(4)[1], MATH 141 GQ(4)[1], MATH 220 GQ(2), SUR 111(3)[1], SUR 112(3), SUR 162(3)[1] (Sem: 1-2)
CAS 100A GWS(3), CMPSC 201C GQ(3), MATH 230(4), MATH 251 GQ(4), STAT 401(3), SUR 222(3), SUR 241(3)[1], SUR 262(2) (Sem: 3-4)
ENGL 202C GWS(3), SUR 272(3)[1], SUR 341(3), SUR 351(3), SUR 362(3), SUR 372W(3)[1] (Sem: 5-6)
SUR 441(3), SUR 471(3), SUR 482(3), SUR 490(1) (Sem: 7-8)

ADDITIONAL COURSES (28 credits)
Select 1 credit of First-Year Seminar
ED&G 100(3) or EG T 101(1), EG T 102(1), M I S 103(3) (Sem: 1-2)
CHEM 012 GN(3) or GEOG 010 GN(3) and PHYS 211 GN(4), PHYS 212 GN(4), PHYS 213 GN(2), PHYS 214 GN(2); or CHEM 012 GN(3), GEOG 012 GN(3), PHYS 150 GN(3), PHYS 151(3), 3 credits in natural sciences (Sem: 1-4)
ECON 002 GS(3), ECON 004 GS(3), or ECON 014 GS(3) (Sem: 5-6)
Select 6 credits, from SUR 313(3), SUR 375(2), SUR 385(3), SUR 425(3), SUR 445(3), SUR 455(3), SUR 465(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 9 credits from department list of technical electives (Sem: 5-6, 9-10)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

TELECOMMUNICATIONS

College of Communications

The primary goal of this major is to prepare students for administrative careers in the electronic media. Its professional emphasis is on management and public policy in telecommunications. The major also provides course work for students interested in television production, from the perspective of production management and administration. The major also serves students seeking greater understanding of the social role and social control of the broadcasting and cable industries.

The major is especially designed for students considering careers in local cable systems operation, local radio and television station administration, television network and cable MSO operations, corporate video, local and federal public policy positions, and emerging media industries.

Students must select at least 80 credits in courses outside the College of Communications, including at least 65 in the liberal arts and sciences.

For the B.A. degree in Telecommunications, a minimum of 120 credits is required.

GENERAL EDUCATION: 45 credits
(3 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 21 credits

COLLEGE OF COMMUNICATIONS BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 33 credits[1]
(This includes 3 credits of General Education GS courses.)

PRESCRIBED COURSES (9 credits)
COMM 180(3) (Sem: 3-4)
COMM 387(3), COMM 381(3) (Sem: 5-6)

ADDITIONAL COURSES (15 credits)
ECON 002 GS(3) or ECON 014 GS(3) (Sem: 3-4)
Prior departmental approval is required for courses selected from the following areas:
Select 9 credits from COMM 283W(3), COMM 383(3), COMM 384(3), COMM 385(3), COMM 386(3), COMM 479(3), COMM 484(3), COMM 485(3), COMM 487(3), COMM 489W(3), COMM 490(3), COMM 491(3), COMM 492(3), COMM 493(3) (Sem: 5-8)
Select 3 credits from COMM 205 GI(3), COMM 403(3), COMM 404(3), COMM 405(3), COMM 408(3), COMM 409(3), COMM 410(3), COMM 411(3), COMM 413(3), COMM 417(3), COMM 419(3), COMM 480(3), or COMM 496(1-3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 9 credits from any Communications course (Sem: 5-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

THEATRE, B.A.

College of Arts and Architecture
This program offers the student interested in theatre a general background in the various areas of theatre. A broad liberal education is provided and complemented with advanced courses to best serve student interests, talents, and career objectives.

Though a strong emphasis is given to the general areas of production and performance, each student may elect to concentrate in an area of special interest such as acting, design, or dramatic literature. Students are also encouraged to explore the related areas of art, music, dance, film, television, and literature. All Theatre majors are expected to participate in a technical capacity in one theatre production for each of six semesters. The distribution of production credits must include 6 credits of THEA 160(3), THEA 170(3), THEA 180(3), and 4 credits from THEA 289(1) (maximum of 2 credits) and THEA 489(1).

For the B.A. degree in Theatre, a minimum of 120 credits is required.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR:
(Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 14 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 37 credits[1]

PRESCRIBED COURSES (24 credits)
THEA 100 GA(3), THEA 101S(3), THEA 120(3), THEA 150(3) (Sem: 1-2)
THEA 401W(3), THEA 402W(3), THEA 410(3), THEA 434(3) (Sem: 5-8)

ADDITIONAL COURSES (13 credits)
Select 6 credits from THEA 160(3), THEA 170(3), THEA 180(3) (Sem: 3-6)
Select 4 credits from THEA 289(1) (maximum of 2 credits) and THEA 489(1) (Sem: 3-6)
Select 3 credits from THEA 405(3), THEA 406 DF(3), THEA 407 GI(3), THEA 408(3), THEA 412 GI(3), THEA 455(3), THEA 464(3) (Sem: 5-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

THEATRE, B.F.A.

College of Arts and Architecture
This major offers three options: Musical Theatre, Production, and Stage Management. All three options are intended to provide students with specialized training leading to a high level of competence in their respective fields. Graduates should be able to begin professional work or pursue further training at the graduate level. The Musical Theatre option is intended for those students who wish to pursue a career as a musical theatre professional. The Production option is intended to train students in the areas of scenery, lighting, costume, and technical direction. The Stage Management option is intended to train students for a career in stage management for theatre.

For the B.F.A. degree in Theatre with the Musical Theatre option, a minimum of 127 credits is required; with

the Production option, a minimum of 128 credits is required; with the Stage Management option, a minimum of 128 credits is required.

GENERAL EDUCATION: 45 credits
(0-3 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in GENERAL EDUCATION course selection or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in GENERAL EDUCATION course selection or REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 83-85 credits
(This includes 0-3 credits of General Education courses: 3 credits of GA courses in the Musical Theatre option.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 18 credits

PRESCRIBED COURSES (18 credits)[1]
THEA 100 GA(3), THEA 101S(3), THEA 120(3), THEA 150(3) (Sem: 1-2)
THEA 401W(3) (Sem: 5-8)
THEA 434(3) (Sem: 7-8)

REQUIREMENTS FOR THE OPTION: 65-67 credits

MUSICAL THEATRE OPTION: 67 credits

PRESCRIBED COURSES (58 credits)

Theatre courses (15 credits)[1]
THEA 289(3) (Sem: 1-2)
THEA 220(3), THEA 221(3) (Sem: 3-4)
THEA 322(2), THEA 324(2)[5], THEA 325(2) (Sem: 5-6)

Music courses (15 credits)
THEA 113(3) (Sem: 1-2)
THEA 212(3), THEA 214(3), VOICE 212J(1), VOICE 262J(1) (Sem: 3-4)
VOICE 312J(1), VOICE 362J(1) (Sem: 5-6)
VOICE 412J(1), VOICE 462J(1) (Sem: 7-8)

Dance courses (8 credits)[1]
DANCE 231(1), DANCE 232(1) (Sem: 1-2)
DANCE 241(1), DANCE 242(1) (Sem: 3-4)
DANCE 251(1), DANCE 252(1), DANCE 371(1), DANCE 372(1) (Sem: 5-6)

Musical Theatre courses (20 credits)
MUSIC 113(1), MUSIC 114(1), THEA 114(3)[1] (Sem: 1-2)
THEA 223(3)[1], THEA 224(3)[1] (Sem: 3-4)
THEA 408(3)[1] (Sem: 5-6)
THEA 423(3)[1], THEA 424(3)[1] (Sem: 7-8)

ADDITIONAL COURSES (9 credits)
Select 2 credits from either MUSIC 050 GA(1), MUSIC 051 GA(1), or MUSIC 110(1), MUSIC 170(1) (Sem: 1-2)
Select 3 credits from THEA 160(3), THEA 170(3), THEA 180(3) (Sem: 3-4)
Select 2 credits from MUSIC 085 GA(1), MUSIC 089 GA(1), MUSIC 090 GA(1), MUSIC 091 GA(1), MUSIC 092 GA(1), MUSIC 093 GA(1), MUSIC 094 GA(1), MUSIC 103 GA(1), MUSIC 104 GA(1), MUSIC 467(1), THEA 326 (1 per semester, maximum of 3) (Sem: 3-6)
Select 2 credits, one from each of the following groups (Students may apply 6 credits of ROTC.):
a. DANCE 431(1), DANCE 441(1), DANCE 451(1) (Sem: 7-8)
b. DANCE 432(1), DANCE 442(1), DANCE 452(1) (Sem: 7-8)

PRODUCTION OPTION: 65 credits

PRESCRIBED COURSES (33 credits)[1]
THEA 160(3), THEA 170(3), THEA 180(3) (Sem: 1-4)
THEA 350(3), THEA 380(3) (Sem: 3-4)

THEA 251(2), THEA 252(1), THEA 260(3), THEA 270(3) (Sem: 3-6)
THEA 410(3) (Sem: 3-8)
THEA 481(3) (Sem: 5-6)
THEA 402W(3) (Sem: 5-8)

ADDITIONAL COURSES (29 credits)
Select 24 credits from the following Focus Courses:
A E 444(3), A E 461(3), THEA 146(2), THEA 253(1), THEA 361(3)[1], THEA 370(3)[1], THEA 381(3), THEA 400(1-6)[1], THEA 447(1-6), THEA 450(3)[1], THEA 451(1), THEA 452(1), THEA 453(1-3)[1], THEA 454(3), THEA 455(3), THEA 459(1), THEA 460(3)[1], THEA 461(3)[1], THEA 464(3), THEA 470(3), THEA 471(3), THEA 473(3), THEA 475(3), THEA 480A(3), THEA 480B(3)[1], THEA 483A(3), THEA 483B(3), THEA 485(3)[1], THEA 496(1-18)[1], THEA 497(1-9)[1] (Sem: 5-8)
Select 5 credits from the following Practicum Courses (no more than 2 credits at the 200 level):
THEA 289(1 per semester, maximum of 3), THEA 437 (1-6), THEA 456(1 per semester, maximum of 6), THEA 457(1 per semester, maximum of 6), THEA 466(1 per semester, maximum of 6), THEA 467(1 per semester, maximum of 6), THEA 477(1 per semester, maximum of 6), THEA 487(1 per semester, maximum of 6), THEA 489(1 per semester) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (3 credits)
Select 3 credits in consultation with adviser from courses in dramatic literature or theatre history (Sem: 5-8)

STAGE MANAGEMENT OPTION: 65 credits[1]

PRESCRIBED COURSES (47 credits)
THEA 146(2), THEA 270(3), THEA 322(2), THEA 324(2) (Sem: 1-4)
THEA 220(3) (Sem: 3-4)
THEA 160(3), THEA 170(3), THEA 180(3) (Sem: 3-6)
THEA 251(2), THEA 410(3), THEA 481(3) (Sem: 5-6)
THEA 402W(3), THEA 485(3), THEA 486(9), THEA 496(3) (Sem: 5-8)

ADDITIONAL COURSES (9 credits)
Select 9 credits from:
THEA 221(3), THEA 260(3), THEA 320(3), THEA 325(2), THEA 350(3) (Sem: 3-6)
THEA 380(3), THEA 405(3), THEA 406 DF(3), THEA 407 GI(3), THEA 408(3), THEA 439(1), THEA 440(3), THEA 470(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 9 credits in consultation with adviser in stage management areas (Sem: 5-8)
(Students may apply 6 credits of ROTC.)
[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
[5] Students may apply 6 credits of ROTC..

TURFGRASS SCIENCE

College of Argricultural Sciences

This major provides an integrated program of study that includes basic and applied sciences, business management courses and an internship to prepare students for careers in turfgrass management and related areas. By carefully selecting supporting courses and electives, students can adapt the program to meet a variety of professional interests and educational needs.

Employment opportunities include golf course maintenance, professional lawn care, grounds maintenance, sod production, sales and service, athletic field maintenance, and research technician.

With appropriate selection of science courses, students can prepare for graduate study leading to careers in teaching, research, and extension.

A student wishing to transfer into the Turfgrass Science program must have completed CHEM 012 GN(3) and CHEM 013 GN(3) or CHEM 034(3) for a total of six credits and received a grade of C or better in each course prior to declaring the major.

For the B.S. degree in Turfgrass Science, a minimum of 128 credits is required.

GENERAL EDUCATION: 45 credits
(18 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selections)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selections)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 17 credits

REQUIREMENTS FOR THE MAJOR: 84 credits
(This includes 18 credits of General Education courses: 3 credits of GWS courses; 6 credits of GQ courses; 9 credits of GN courses.)

PRESCRIBED COURSES (51 credits)
BIOL 011 GN(3), BIOL 012 GN(1), CHEM 012 GN(3), CHEM 034(3) (Sem: 1-4)
BI SC 003 GN(3), BIOL 027 GN(3) (Sem: 1-2,5-6)
CMPSC 203 GQ(4), MATH 021 GQ(3) (Sem: 3-4)
GEOSC 001(3), TURF 235(3)[1], TURF 236(3)[1], TURF 237(3)[1] (Sem: 3-8)
AGRO 402(3), AGRO 490(1), SOILS 101 GN(3)[1], SOILS 401(3) (Sem: 5-6)
TURF 436W(3)[1], TURF 495(3) (Sem: 5-8)

ADDITIONAL COURSES (3 credits)
ENGL 202C GWS(3) or ENGL 202D GWS(3) (Sem: 5-6)

SUPPORTING COURSES AND RELATED AREAS (30 credits)
Select 15 credits from department professional agriculture list (Sem: 3-8)
Select 15 credits from department professional management and economics list (Sem: 3-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

URBAN EARLY AND MIDDLE CHILDHOOD EDUCATION

Commonwealth College: Penn State Delaware County
This major offers extensive teacher preparation for the urban settings of large metropolitan areas. It helps prepare teachers for Early and Middle Childhood levels, and as such spans infant education through grade six education.

Students successfully completing this major will have met all of the requirements for the Nursery to Grade 3, N-3 (i.e., Early Childhood Education) and Kindergarten to Grade 6, K-6 (i.e., Elementary Education) Instructional I certificates issued by the Pennsylvania Department of Education. Students apply for entry into this major prior to the completion of their sophomore year of collegiate study. (See also Teacher Education Programs.)

For the B.S. degree in Urban Early and Middle Childhood Education, 127 credits are required.

GENERAL EDUCATION: 45 credits
(30-33 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 1-6 credits

REQUIREMENTS FOR THE MAJOR: 109-111 credits[21]
(This includes 30-33 credits of General Education courses: 3 credits of GQ courses, 9 credits of GN courses, 3 credits of GHA courses, 6 credits of GA courses, 3-6 credits of GH courses, 6 credits of GS courses.)

PRESCRIBED COURSES (79 credits)
A ED 303(3), C I 295(2), EDPSY 014(3), EDTHP 115(3), MATH 200 GQ(3) (Sem: 3-4)
EDTHP 411 DF(3), KINES 380(1), MUSIC 241(3) URBED 400(5) (Sem: 5)
URBED 395W(6) (Sem: 5-7)
SPLED 444(6), URBED 401(10) (Sem: 6)
EDTHP 416(3), URBED 402(7), URBED 403(6) (Sem: 7)
C I 495D(12), C I 495F(3) (Sem: 8)

ADDITIONAL COURSES (27-29 credits)
A. Select 9-10 credits; 3-4 credits each from a, b, and c:
a. ANTH 021 GN(3), BI SC 001 GN(3), BI SC 002 GN(3), BI SC 003 GN(3), BI SC 004 GN(3), BIOL 110 GN(4), BIOL 129 GN(4), BIOL 141 GN(3), BIOL 220W GN(4), BIOL 230W GN(4), BIOL 240W GN(4) (Sem: 1-4)
b. CHEM 001 GN(3), CHEM 002 GN(3), CHEM 012 GN(3), MATSE 081 GN(3), MATSC 101 GN(3), PHYS 001 GN(3) (Sem: 1-4)
c. EARTH 002 GN(3), EARTH 101 GN(3), EM SC 150 GN(3)/S T S 150 GN(3), GEOG 010 GN(3), GEOSC 020 GN(3), GEOSC 021 GN(3), METEO 003 GN(3), METEO 101 GN(3) (Sem: 1-4)

B. Select 6 credits; 3 credits each from a and b:
a. ART H 112 GA(3), ART H 120 GA;GI(3), ART H 130 GA;GI(3), ART H 320 GA;GI(3), INART 001 GA(3), INART 005 GA(3), INART 010 GA(3), MUSIC 005 GA(3), MUSIC 007 GA;GI(3), MUSIC 009 GA;GI(3) (Sem: 1-4)
b. ART 010 GA(3), COMM 150 GA(3), ENGL 050 GA(3), THEA 100GA(3), THEA 102 GA(3), THEA 105 GA(3) (Sem: 1-4)

C. Select 3 credits from AM ST 100 GH(3), AM ST 104 GH;GI(3), AM ST 105 GH;GI(3), HIST 020 GH(3), HIST 021 GH(3), HIST 154 GI(3) (Sem: 1-4)

D. Select 6-7 credits from COMM 100 GS(3), HD FS 129 GS(3), HD FS 229 GS(3), PSY 002 GS(3), PSY 213 GS(3), SOC 005 GS(3), SOC 015 GS(3), SOC 119 GS;GI(4) (Sem: 1-4)

E. Select 3 credits from KINES 013 GHA(1), KINES 015 GHS(1), BB H 019 GHS(1), BB H 043 GHS(1), BB H 046 GHS(1), H P A 057 GHA(3), KINES 303 GHA(3) (Sem: 1-4)

SUPPORTING COURSES AND RELATED AREAS (3 credits)
Select 3 credits of literature courses from department list (may double count for General Education GH) (Sem: 1-4)
[21] A grade of C or better per course is required for all Special Education prerequisites and teacher certification.

WILDLIFE AND FISHERIES SCIENCE

College of Agricultural Sciences
The purpose of the Wildlife and Fisheries Science major is to develop the knowledge, skills, and professional ethics of undergraduates interested in the conservation and management of fish and wildlife and their environments. The curriculum is designed to provide a broad-based science background that incorporates natural resource management principles that prepare our students for a diverse array of opportunities such as graduate school, natural resource management agencies, consulting firms, nonprofits, etc. Students can choose from two options: Wildlife option and Fisheries option. Each option enables students to gain greater depth of knowledge in one area of the discipline. Course work required for the Wildlife option meets The Wildlife Society's requirements for professional certification, and course work required for the Fisheries option meets the American Fisheries Society's requirements for professional certification.

For the B.S. in Wildlife and Fisheries Science, a minimum of 120 credits is required for the Wildlife option and a minimum of 122 credits is required for the Fisheries option.

GENERAL EDUCATION: 45 credits
(21 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 3-10 credits

REQUIREMENTS FOR THE MAJOR: 86-95 credits
(This includes 21 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses; 3 credits of GWS courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 69-72 credits

PRESCRIBED COURSES (45 credits)
BIOL 110 GN(4), BIOL 220W GN(4)[1], CHEM 012 GN(3), CHEM 014 GN(1) (Sem: 1-4)
BIOL 240W GN(4), CHEM 034(3), PHYS 250 GN(4), SOILS 101 GN(3), W F S 209(3) (Sem: 3-4)
ECON 004 GS(3), W F S 300(2)[1], W F S 301(2)[1], W F S 310(3)[1] (Sem: 5-6)
W F S 446(3), ENGL 202C GWS(3) (Sem: 7-8)

ADDITIONAL COURSES (18-21 credits)
MATH 110 GQ(4)[1] or MATH 140 GQ(4)[1]; MATH 111 GQ(2) or MATH 141 GQ(4) (Sem: 1-2)
BIOL 222(3) or BIOL 230W GN(4); STAT 240W GN(3) or STAT 301 GQ(3) (Sem: 3-4)
FOR 350(3) or STAT 460(3) (Sem: 5-6)
AEE 440(3), CAS 211(3), ENGL 416(3), or ENGL 418(3) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits in natural resource economics, policy, planning, law, administration, or human dimensions from departmental list (Sem: 5-8)

REQUIREMENTS FOR THE OPTION: 17-23 credits

FISHERIES OPTION: 22-23 credits

PRESCRIBED COURSES (10 credits)
W F S 452(2), W F S 453(2) (Sem: 5-6)
W F S 410(3), W F S 463W(3) (Sem: 5-8)

ADDITIONAL COURSES (12-13 credits)
BIOL 141 GN(3), BIOL 142(1); or BIOL 446(3), or AN SC 001(4) (Sem: 5-6)
W F S 407(3), W F S 408(3), or W F S 447W(3) (Sem: 5-8)
BIOL 435(3), ENT 425(3), FOR 470(3), or W F S 422(3) (Sem: 5-8)
E R M 475(3), GEOG 121 GS(3), GEOG 357(3), GEOSC 303(3), GEOSC 340(3), GEOSC 412(3), GEOSC 440(3), or GEOSC 452(3) (Sem: 7-8)

WILDLIFE OPTION: 17-18 credits

PRESCRIBED COURSES (11 credits)
FOR 203(2) (Sem: 3-4)
W F S 407(3), W F S 408(3) (Sem: 5-6)
W F S 447W(3) (Sem: 7-8)

ADDITIONAL COURSES (6-7 credits)
W F S 406(1) or W F S 409(1) (Sem: 5-6)
W F S 410(3), W F S 422(3), W F S 452(2), W F S 453(2), or W F S 463W(3) (Sem: 5-8)
BIOL 414(3), FOR 308(3), HORT 101 GN(3), HORT 138(3), or HORT 445(3) (Sem: 7-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

WOMEN'S STUDIES, B.A.

College of the Liberal Arts
This interdisciplinary major is designed to develop a broad understanding of the study of women and women's perspectives in all areas of academic scholarship. The focus is on feminist analyses of women's lives, of women's social, cultural, and scientific contributions, and of the structure of sex/gender systems. The interdisciplinary and inclusive nature of the field is reflected in a curricular structure that includes courses cross-listed with a wide variety of departments, courses that deal with aspects of women's lives throughout history, and courses that recognize the diversities of culture, race, religion, ethnicity, age, disability, and sexual orientation.

For the B.A. degree in Women's Studies, a minimum of 123 credits is required.

GENERAL EDUCATION: 45 credits
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 18 credits

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(See description of Bachelor of Arts Degree Requirements in front of Bulletin.)

REQUIREMENTS FOR THE MAJOR: 36 credits[1]

PRESCRIBED COURSE (6 credits)
WMNST 301(3) (Sem: 1-4)
WMNST 492W(3) (Sem: 7-8)

ADDITIONAL COURSES (9 credits)
WMNST 001 GS;GI(3) or WMNST 003 GS;GI(3) (Sem: 1-4)
WMNST 400 GI(3) or WMNST 401(3) (Sem: 3-7)
WMNST 494(3), WMNST 495(3), or WMNST 496(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (21 credits)
Select 21 credits in Women's Studies from the program-approved list and in consultation with an adviser; at least 6 credits must be at the 400 level (Sem: 1-8):
a. 6 credits of arts and humanities courses
b. 6 credits of natural or social sciences courses
c. at least 3 credits that focus on non-Western women
d. at least 3 credits that focus on women of color in the United States
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

WOMEN'S STUDIES, B.S.

College of the Liberal Arts

This interdisciplinary major is designed to develop a broad understanding of the study of women and women's perspectives in all areas of academic scholarship. The focus is on feminist analyses of women's lives, of women's social, cultural, and scientific contributions, and of the structure of sex/gender systems. The interdisciplinary and inclusive nature of the field is reflected in a curricular structure that includes courses cross-listed with a wide variety of departments, courses that deal with aspects of women's lives throughout history, and courses that recognize the diversities of culture, race, religion, ethnicity, age, disability, and sexual orientation.

Students may choose either a Bachelor of Arts or a Bachelor of Science Program. The B.A. degree in Women's Studies is a traditional Women's Studies degree. The B.S. degree is intended for students with strong interest in quantitative skills, women's health and sexuality, and/or women and science, or who wish to pursue a multiple major program with other B.S. degree programs.

For the B.S. degree in Women's Studies, a minimum of 120 credits is required.

GENERAL EDUCATION: 45 credits
(3-12 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 21-30 credits

REQUIREMENTS FOR THE MAJOR: 57 credits[1]
(This includes 3-12 credits of General Education courses: 3-6 credits of GQ courses, 0-3 credits of GH courses, and 0-3 credits of GS courses.)

PRESCRIBED COURSES (6 credits)
WMNST 301(3) (Sem: 1-4)
WMNST 492W(3) (Sem: 7-8)

ADDITIONAL COURSES (36 credits)
Select 3 credits from WMNST 001 GS;GI(3) or WMNST 003 GS;GI(3) (Sem: 1-4)
Select 3 credits from WMNST 400 DF(3) or WMNST 401(3) (Sem: 5-8)
Select 3 credits from WMNST 494(3), WMNST 495(3), or WMNST 496(3) (Sem: 5-8)
Select 27 credits in Women's Studies from the program-approved lists. At least 9 credits must be at the 400 level. The same course may be used to fulfill more than one requirement within Additional Courses. (Sem: 1-8).
a. 6 credits of arts and humanities courses: WMNST 003 GH(3), WMNST 083S GH(3), WMNST 101 GH(3), WMNST 102 GH(3), WMNST 104(3), WMNST 117 GH(3), WMNST 137 GH(3), WMNST 194 GH(3), WMNST 407(3), WMNST 419(3), WMNST 421(3), WMNST 438(3), WMNST 457(3), WMNST 462(3), WMNST 466(3), WMNST 490(3) (Sem: 1-8)
b. 9 credits of natural or social sciences courses: WMNST 001 GS(3), WMNST 005(3), WMNST 103(3), WMNST 110 GS(3), WMNST 116 GS(3), WMNST 136 GS(3), WMNST 202 GS(3), WMNST 205(3), WMNST 410(3), WMNST 412(3), WMNST 415W(3), WMNST 420(3), WMNST 423(3), WMNST 424(3), WMNST 428(3), WMNST 452(3), WMNST 453(3), WMNST 455(3), WMNST 456(3), WMNST 458(3), WMNST 471(3), WMNST 476W(3) (Sem: 1-8)
c. at least 6 credits that focus on women's health and sexuality or women in science and technology: WMNST 005(3), WMNST 205(3), WMNST 452(3), WMNST 457(3), WMNST 458(3) (Sem: 1-8)
d. at least 3 credits that focus on non-Western women: WMNST 102 GH(3), WMNST 202 GS(3), WMNST 420(3), WMNST 476W(3) (Sem: 1-8)
e. at least 3 credits that focus on women of color in the United States: WMNST 101 GH(3), WMNST 103(3), WMNST 136 GS(3), WMNST 205(3), WMNST 410(3) (Sem: 1-8)

SUPPORTING COURSES AND RELATED AREAS (15 credits)
Select 15 credits total from groups a, b, and c, with at least 3 credits from each group.
a. Quantification (GQ) and Research Methods (Sem: 1-8)
b. Values, Ethics, and Scientific Inquiry (Sem: 1-8)
c. Social and behavioral sciences, health sciences, or natural sciences (Sem: 1-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

WOOD PRODUCTS

College of Agricultural Sciences

The primary purpose of this major is to help prepare students for careers in the wood products industry. Students can choose from two options: Wood Products Business and Marketing and Wood Products Processing and Manufacturing. The options are designed to give the student flexibility for a science or business/marketing emphasis supported by a general education in communication, natural science, social science and humanities, and quantification.

Proper selection in elective courses enables the student to be prepared for employment in various aspects of wood products business management or marketing, process and product quality control, or research and development. The wide scope of the wood industry—from harvesting to the use of wood, fiber, and chemical products—presents a broad spectrum of employment opportunities. Within the employment spectrum are jobs related to roundwood processing to lumber and plywood, drying and protection of wood and fiber products, adhesives and coatings, reconstituted wood composites, paper manufacture, board products, and construction and housing.

For the B.S. degree in Wood Products, a minimum of 125 credits is required. Students should be aware that completion of the Wood Products degree in four years is difficult if they are not at the University Park campus beginning the fall semester of the sophomore year.

GENERAL EDUCATION: 45 credits
(12-19 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES or GENERAL EDUCATION course selection)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 2-6 credits

REQUIREMENTS FOR THE MAJOR: 86-97 credits
(For the Business and Marketing option this includes 12 credits of General Education courses: 3 credits of GWS courses; 3 credits of GS courses; 6 credits of GQ courses. For the Processing and Manufacturing option this includes 19 credits of General Education courses: 3 credits of GWS courses, 3 credits of GS courses, 6 credits of GQ courses, and 7 credits of GN courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 40-42 credits

PRESCRIBED COURSES (25 credits)
MATH 110 GQ(4), MATH 111 GQ(2) (Sem: 1-4)
W P 200W(3)[1], FOR 203(2)[1], W P 411(4) (Sem: 3-4)
W P 203(1)[1] (Sem: 3-6)
W P 417(4)[1], W P 437W(4)[1], W P 490(1)[1] (Sem: 5-8)

ADDITIONAL COURSES (15-17 credits)
Select 3-4 credits from CMPSC 101 GQ(3), CMPSC 103 GQ(4), CMPSC 201C GQ(3), CMPSC 201F GQ(3), or CMPSC 203 GQ(4) (Sem: 3-4)
Select 3-4 credits of STAT 200 GQ(4), STAT 240(3), STAT 250 GQ(3), or STAT 301 GQ(3) (Sem: 3-6)
ENGL 202C GWS(3) or ENGL 202D GWS(3) (Sem: 3-6)
CAS 211(3) or ENGL 215(3) (Sem: 3-6)
ECON 002 GS(3), ECON 004 GS(3), or ECON 014 GS(3) (Sem: 3-6)

REQUIREMENTS FOR THE OPTION: 46-55 credits

WOOD PRODUCTS BUSINESS AND MARKETING OPTION: 46-48 credits

PRESCRIBED COURSES (3 credits)
W P 435(3) (Sem: 5-8)

ADDITIONAL COURSES (27 credits)

Select 27 credits from ACCTG 211(4), AG BM 101 GS(3) or ECON 002 GS(3), AG EC 350(3), B A 250(3), B LAW 243(3), B LOG 301(3), ECON 004 GS(3), FIN 100(3), ECON 315 GS(3) or L I R 100 GS(3), I B 303(3) or ECON 333 GS(3), I E 302(3), MGMT 100(3), MKTG 221(3), PSY 002 GS(3), any GQ B A course or CMPSC 203 GQ(4), or any additional W P course (2-3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (16-18 credits)
Select 16-18 credits in consultation with adviser from department list.
(Students may apply 3 credits of ROTC.)

WOOD PRODUCTS PROCESSING AND MANUFACTURING OPTION: 53-55 credits

PRESCRIBED COURSES (21 credits)
CHEM 012 GN(3), CHEM 013 GN(3), CHEM 014 GN(1) (Sem: 1-4)
W P 337(2), W P 412(3), W P 413(3), W P 418(4), W P 423(2) (Sem: 5-8)

ADDITIONAL COURSES (17-19 credits)
Select 17-19 credits from BIOL, BI SC (GN), PHYS (GN) biochemistry or organic chemistry, and any additional W P courses (Sem: 1-4)

SUPPORTING COURSES AND RELATED AREAS (15 credits)
Select 15 credits in consultation with adviser from department list.
(Students may apply 3 credits of ROTC.) (Sem: 5-8)
[1] A student in this major must receive a grade of C or better in all courses, as specified in Senate Policy 82-44.

WORKFORCE EDUCATION AND DEVELOPMENT

College of Education
This major leads to the B.S. degree and may also lead to certification as a career and technical education teacher, and/or a coordinator of cooperative education, provided other requirements of the Pennsylvania Department of Education are met. The Industrial Training option does not lead to teacher certification.

To be certified by the Pennsylvania Department of Education as a career and technical education teacher, a person must have sufficient employment experience beyond the learning period to establish competency in the occupation to be taught. Further interpretation of this requirement may be secured by contacting the Department of Adult Education, Instructional Systems, and Workforce Education and Development. (See also Teacher Education Programs.)

For the B.S. degree in Workforce Education and Development, a minimum of 127 credits is required.

GENERAL EDUCATION: 45 credits
(3 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in ELECTIVES or GENERAL EDUCATION course selection)
INTERCULTURAL AND INTERNATIONAL COMPETENCE: (Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)
WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 0-1 credits

REQUIREMENTS FOR THE MAJOR: 84-85 credits
(This includes 3 credits of General Education GS courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 41 credits[18]

PRESCRIBED COURSES (35 credits)
ECON 014 GS(3), EDPSY 014(3), EDTHP 115(3), WF ED 001(3), WF ED 101(1), WF ED 105(3), WF ED 323(3) (Sem: 3-6)
WF ED 445(3) (Sem: 3-8)
WF ED 106(3), WF ED 207W(3), WF ED 413(3), WF ED 441(2) (Sem: 5-8)
WF ED 442(2) (Sem: 7-8)

ADDITIONAL COURSES (6 credits)
EDTHP 411 DF(3), EDTHP 412 DF(3), or WF ED 450 DF(3) (Sem: 3-6)
HD FS 129(3), HD FS 216(3), HD FS 239(3), or SPLED 400(3) (Sem: 3-6)

REQUIREMENTS FOR THE OPTION: 43 credits

HEALTH OCCUPATIONS EDUCATION OPTION: 43 credits[18]

PRESCRIBED COURSES (34 credits)
WF ED 395C(24) (Sem: 5-8)
WF ED 495C(10) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 9 credits in course work related to the student's field of study (Sem: 3-8)
(Students may apply 6 credits of ROTC.)

INDUSTRIAL EDUCATION OPTION: 43 credits[18]

PRESCRIBED COURSES (34 credits)
WF ED 395A(24) (Sem: 5-8)
WF ED 495C(10) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 9 credits of course work related to the student's field of study (Sem: 3-8)
(Students may apply 6 credits of ROTC.)

INDUSTRIAL TRAINING OPTION: 44 credits[18]

PRESCRIBED COURSES (35 credits)
WF ED 270(3) (Sem: 3-6)
WF ED 471(3) (Sem: 5-6)
WF ED 395D(24) (Sem: 5-8)
WF ED 495D(5) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 9 credits in course work related to the student's field of study (Sem: 3-8)
(Students may apply 6 credits of ROTC.)

OCCUPATIONAL HOME ECONOMICS EDUCATION OPTION: 43 credits[18]

PRESCRIBED COURSES (34 credits)
WF ED 395B(24) (Sem: 5-8)
WF ED 495C(10) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 9 credits in course work related to the student's field of study (Sem: 3-8)
[18] A grade of C or better per course is required for teacher certification.

ACADEMIC MINOR DESCRIPTIONS

SCHEDULING RECOMMENDATION BY SEMESTER STANDING IS GIVEN LIKE THIS: (SEM: 1-2)

ACCOUNTING MINOR

Penn State Erie, The Behrend College
A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 20 credits

PRESCRIBED COURSES: (14 credits)
ACCTG 211(4) (Sem: 3-4)
ACNTG 310(4), ACNTG 320(3) (Sem: 5-6)
ACNTG 412(3) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS: (6 credits)
Select 6 credits of additional ACNTG courses, at least 3 credits at the 400 level (Sem: 3-8)

AFRICAN AMERICAN STUDIES MINOR

Abington College; College of the Liberal Arts

The Department of African and African American Studies awards a certificate to students who, in addition to meeting the requirements for a major, complete 18 credits in the African American Studies minor. This minor is designed for students interested in African American culture and the educational, social, political, and economic development of people of African descent in the United States. In particular, it provides students with the opportunity to explore the experiences of African Americans using theories and methods originating in the field. Students are made aware of the potential to apply such knowledge to the solution of social, political, and economic problems. The minor also promotes greater understanding of the relationship between African Americans and other ethnic groups. A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (9 credits)
AAA S 100 GS;GI(3), AAA S 101 GH;DF(3), AAA S/HIST 191 GH;GI(3) (Sem: 1-4)

ADDITIONAL COURSES (9 credits)
Select 9 credits from the following (6 credits must be at the 400 level):
AAA S 102 GH;GI(3), AAA S 103 GI(3), AAA S 110 GS;DF(3), AAA S 132 GI(3), AAA S 145 GH;GI(3), AAA S 146 GH;GI(3), AAA S 147 GH;GI(3) (Sem: 1-4)
AAA S 403(3), ADM J 451 GI(3), AM ST 405(3), BB H 302 GI(3), COMM/WMNST 205 DF(3), COMM 411(3), ECON 435(3), EDTHP 411 DF(3), ENGL 431 GI(3), LL ED 402(3), MUSIC 007 GA;GI(3), SOC 119 GS;GI(4), SOC 409 GS;GI(3) (Sem: 5-8)

AFRICAN STUDIES MINOR

College of the Liberal Arts

The minor in African Studies is designed to educate students about the history, the culture, and the social institutions of the African peoples residing in the African continent. There are more than 22,000 languages and many more dialects in Africa today. The complexity and depth of African history is clear. From the original cultivation of sorghum and coffee to the domestication of cattle to the creation of the human family, the African continent has been in the forefront of world history.

Most world history courses set Africa at the furthest periphery of world history, but the African Studies minor will place Africa in its proper place as fundamental to the development of world history. Since the history of this continent has been so "misunderstood," students will learn how to look at historical documents and modern journalism with a very critical eye. The understanding of the methodologies employed in recapturing African history such as historical linguistics, archaeology, oral tradition, folklore, and oral histories will also be studied. A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (12 credits)
AAA S 100 GS;GI(3), AAA S/HIST 191 GH;GI(3), AAA S 201 GS;DF(3) (Sem: 1-4)
AAA S 405(3) (Sem: 5-8)

ADDITIONAL COURSES (6 credits)
Select 6 credits from the following (3 credits must be at the 400 level):
AAA S 110 GS(3), AAA S 150 GH;DF(3), AAA S/HIST 192 GH;GI(3), CMLIT 003 GH;GI(3), (Sem: 1-4)
AAA S 400(3), AAA S 403(3), AAA S 404 DF(3), AAA S 431 GI(3), CMLIT 422(3), CMLIT 423(3), (Sem: 5-8)

AGRICULTURAL AND BIOLOGICAL ENGINEERING MINOR

College of Agricultural Sciences

This minor provides students with an opportunity to apply engineering principles to agricultural and biological production and processing systems and to the management of our natural resources. Courses may be selected by students to gain a better understanding of soil conservation and water quality, food and biological process engineering, structures and their environments, power and machinery, or microbiological engineering.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18-19 credits

PRESCRIBED COURSES (3 credits)
A B E 400(3) (Sem: 7-8)

ADDITIONAL COURSES (15-16 credits)
Select 6 credits from A B E 402(3), A B E 403(1.5), A B E 404(3), A B E 405(3), A B E 406(1.5), A B E 408(3) (Sem: 7-8)

Select 9-10 credits from one of the following areas; one course marked with * must be selected (Sem: 7-8)
(a) Power and Machinery Systems: A B E 461(3)*, A S M 420(3), A S M 424(3), M E 050(3), M E 413(3)
(b) Biological Systems: A B E 468(4)*, BIOE 401(3), CH E 409(3), CH E 438(3), CHEM 034(3), MICRB 201(3)
(c) Natural Resource Systems: A B E 467(4)*, A S M 457(3), C E 361(3), C E 370(3), C E 371(3), C E 471(3)
(d) Food Process Systems: A B E 465(4)*, CH E 446(3), FD SC 430(3), I E 312(3)
(e) Structural Systems: A B E 462(3)*, A E 308(4), C E 340(3), C E 341(3), C E 342(3)

AGRIBUSINESS MANAGEMENT MINOR

College of Agricultural Sciences; Smeal College of Business
A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (9 credits)
AG BM 102(3), AG BM 106(3), AG BM 200(3) (Sem: 2-6)

ADDITIONAL COURSES (9 credits)
Select 9 credits from AG 301W(3), AG BM 302(3), AG BM 308W(3), AG BM 320(3), AG BM 338(3), AG BM 407(3), AG BM 408(3), AG BM 420(3), AG BM 440(3), AG BM 460(3), AG BM 461W(3), and AG BM 495A(1-3) or AG BM 495B(1-3) (Sem: 5-8)

AGRICULTURAL COMMUNICATIONS MINOR

College of Agricultural Sciences
Through the Department of Agricultural and Extension Education, this interdisciplinary program of study is designed to introduce majors in the College of Agricultural Sciences to the skills and professional practices in communications and to the interdependence between communications and society. A grade of C or better is required in every course used to satisfy the requirements for the minor.

Students are required to complete a total of 18 credits, including 6 credits at the 400 level.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (6 credits)
COMM 260W(3) (Sem: 3-4)
AGCOM 362W(3) (Sem: 5-8)

ADDITIONAL COURSES (12 credits)
Select 3-6 credits from AG ED (EXTED) 330W(3), AG ED (EXTED) 440(3), or AGCOM 495(1-3) (Sem: 3-8)
Select 3-6 credits from COMM 180(3), COMM 283W(2), COMM 401(3), COMM 403(3), COMM 405(3), COMM 409(3), COMM 411(3), COMM 413(3), COMM 460W(3), or COMM 463(3) (Sem: 3-8)
Select 3 credits from COMM 401(3), COMM 403(3), COMM 405(3), COMM 409(3), or COMM 413(3) (Sem: 5-8)

AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY MINOR

College of Agricultural Sciences
A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

SUPPORTING COURSES AND RELATED AREAS: (18 credits)
Select 12 credits of Agricultural Economics and Rural Sociology courses (Sem: 1-6)

AGRICULTURAL MECHANIZATION TECHNOLOGY MINOR

College of Agricultural Sciences
The Agricultural Mechanization Technology minor covers the mechanical, structural, natural resource, processing, and electronic technologies applied in agriculture systems. Students who graduate with this minor will have a solid understanding of how physical sciences and biological principles apply to real-world problems in food and fiber industries. With industry teams often formed purposefully with many disciplines represented, this background of applied engineering basics and the focus on quantitative analysis has proven helpful to past graduates.

Integration of the applied technologies is addressed using a systems approach in each required course. Technologies addressed by courses in this minor include combustion engines, electric motors, mechanical and hydraulic power transmission systems, mobile equipment functions and operations, sensor and control systems,

building structures, ventilation, drying, irrigation, drainage, food processing. The minor is targeted to students who will use these technologies or manage others who are responsible for systems utilizing these technologies. Most courses required for the minor are taught by engineering faculty, and nearly every course has a laboratory period.

Admission to the minor requires introductory calculus (MATH 110 or higher) and introductory physics (PHYS 250 or higher). Students in the Agricultural Systems Management major cannot receive the AG M minor.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

ADDITIONAL COURSES: (18 credits)
Students must select from the following to account for 18 or more credits: A S M 221(3), A S M 320(3), A S M 327(3), A S M 422(3), A S M 424(3), A S M 425(3), A S M 428(3), A S M 429(3), A S M 457(3). A total of 3 credits in A S M 496(3) and A S M 497(3) may also be used.

AGRONOMY MINOR

College of Agricultural Sciences

Agronomy is concerned with the principles and practices of field crop production and the conservation of soils and land resources. Areas of emphasis include crop production and protection, plant breeding, forage management, nutrient management, and soil conservation and fertility. Education in this minor emphasizes the principles of plant and soil management and the basic sciences upon which these principles are grounded. A minor in agronomy can complement several majors, and will enhance career opportunities in farm management and the agricultural industry. Employment possibilities include farm chemical and fertilizer store managers, sales representatives, field and laboratory technicians, crop management consultants, extension agents, soil and water conservationists, and inspectors for various state and federal regulatory agencies.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES: (6 credits)
AGRO 028(3), SOILS 101 GN(3) (Sem: 3-4)

ADDITIONAL COURSES: (6 credits)
Select 6 credits from AGRO 423(3), AGRO 425(3), AGRO 438A(5), or SOILS 402(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS: (6 credits)
Select 6 credits from courses in Entomology, Plant Pathology or AGRO 495(1-5) (Sem: 5-8)

AMERICAN STUDIES MINOR

Abington College; Commonwealth College; College of the Liberal Arts

This interdisciplinary minor administered by the Department of English is designed for students who want to complement their major program. With the approval of the American Studies Program committee, appropriate courses other than those below may be selected, including those from the 200, 496, and 497 series. To complete the minor successfully, a candidate must complete the course requirements with at least a C cumulative grade-point average. The minor consists of 18 credits.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (3 credits)
AM ST 402W(3) (Sem: 5-8)

ADDITIONAL COURSES (15 credits)
AM ST 100 GH(3), AM ST 100W(3), or AM ST 105 GH;DF(3) (Sem: 1-4)
Select 12 credits from the following list, including at least 6 credits at the 400 level:
ADM J 111(3), ADM J 221(3), ART H 307 GA(3), COMM 100 GS(3), COMM 120(3), COMM 180(3), COMM 205 GI(3), COMM 250 GA(3), ENGL 133 GH(3), ENGL 134 GH(3), ENGL 139 GH;GI(3), ENGL 140 GH(3), ENGL 194 GH;GI(3), ENGL 231W(3), ENGL 232W(3), HIST 020 GH(3), HIST 021 GH(3), HIST 150(3), HIST 151 GS(3), HIST 152 GH;GI(3), HIST 155 GS(3), HIST 156(3), HIST 158(3), L I R 156(3), MUSIC 007 GA;GI(3), PL SC 001 GS(3), RL ST 140W GH;GI(3), RL ST 145 GH;GI(3), WMNST 001 GS;DF(3) (Sem: 1-8)
ADM J 285(3), ADM J 421(3), ADM J 451 GI(3), ADM J 472(3), AM ST 405(3), AM ST 410(3), AM ST 415(3), ART H 404(3), ART H 415(3), ART H 416(3), CAS 415(3), CAS 478(3), COMM 407(3), COMM

408(3), COMM 409(3), COMM 411(3), COMM 413(3), COMM 426(3), ENGL 430(3), ENGL 432(3), ENGL 433(3), ENGL 435(3), ENGL 436(3), ENGL 437(3), ENGL 438(3), ENGL 439(3), ENGL 458(3), ENGL 490 GI(3), ENGL 493(3), KINES 441(3), KINES 444(3), HIST 441(3), HIST 442(3), HIST 444(3), HIST 445(3), HIST 446(3), HIST 447(3), HIST 449(3), HIST 450(3), HIST 452(3), HIST 454(3), HIST 458W(3), HIST 459W(3), HIST 460(3), L I R 411(3), L I R 414W(3), L I R 458W(3), MUSIC 464W(3), PHIL 401(3), PHIL 403(3), PHIL 432(3), PL SC 417(3), PL SC 419(3), PL SC 425(3), PL SC 426(3), PL SC 427(3), PL SC 435(3), PL SC 436(3), PL SC 472(3), PL SC 474(3), RL ST 422(3), SOC 409 GS;GI(3), SOC 412(3), SOC 454(3), SOC 461(3), SOC 462(3), THEA 405(3) (Sem: 5-8)

AMERICAN STUDIES MINOR

Capital College

American Studies is an interdisciplinary field that explores the patterns of life and thought of the American peoples, past and present. Its courses are grouped into three general areas of history, society, and culture, and it has special offerings in public history and heritage studies, material culture, and cultural history. The program encourages students to integrate theories, methods, and findings from various fields, including history, literature, folklore, ethnography, politics, art, architecture, and music. It also encourages applications of this knowledge to public history and cultural conservation. American Studies helps students prepare for further study or careers in education, government, communication, law, museums, historical and cultural agencies, and archives. Internships are available for qualified students in American Studies. The internship is an extension of the student's academic studies and is an opportunity to gain practical experience.

A student seeking admission to the American Studies Minor must first be admitted to a major at Penn State. Upon admission, a Minor Adviser will be appointed from within the American Studies faculty to guide the student. For the American Studies Minor, a total of 18 credits is required. At least 6 credits must be at the 400 level.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (6 credits)
AMSTD 302(3), AMSTD 491W(3) (Sem: 5-8)

ADDITIONAL COURSES (12 credits)
Select 12 credits from any American Studies offerings (AMST or AMSTD). Three of these credits must be at the 400 level. (Sem: 5-8)

ANIMAL SCIENCES MINOR

College of Agricultural Sciences

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 20 credits

PRESCRIBED COURSES: (8 credits)
AN SC 001(4), AN SC 290(1), AN SC 301(3) (Sem: 3-4)
ADDITIONAL COURSES: (6 credits)
Select 3 credits from AN SC 207(2) or AN SC 300 GN(3) (Sem: 3-4)
Select 3 credits from AN SC 305(3), AN SC 306(3), AN SC 308(3), AN SC 309(3), AN SC 310(3), AN SC 311(3), AN SC 327(3) (Sem:3-6)

SUPPORTING COURSES AND RELATED AREAS: (6 credits)
Select 6 credits of 400-level AN SC courses (Sem: 7-8)

ANTHROPOLOGY MINOR

Abington College; College of the Liberal Arts

The Anthropology minor is designed to provide undergraduate students with exposure to the range of human variation across time and space. Our minors enroll in courses that explore that variation through the subdisciplines of archaeological, biological, and cultural anthropology. We maintain laboratory facilities in all three subdisciplines and the Matson Museum of Anthropology, all excellent learning facilities for our students. In addition, the department offers summer field school opportunities in cultural anthropology and archaeology. A minor in Anthropology is excellent preparation for further study in any discipline that requires ability to understand and deal with other cultures, for example, teaching, counseling, business, medicine, law, or communications.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (9 credits)
ANTH 002 GS(3), ANTH 021 GN(3), ANTH 045 GS;DF(3) (Sem: 1-6)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 3 credits from any ANTH course except ANTH 001 GS;GI(3) (Sem: 1-8)
Select 6 credits from the ANTH 400-489 range (Sem: 3-6)

ARCHITECTURAL HISTORY MINOR

College of Arts and Architecture
This interdisciplinary minor administered by the Department of Art History is designed for students interested in exploring architectural history from a variety of disciplines. Majors in Art History may double count only the following Art History courses for their major and this minor: ART 201 and ART 202. Majors in Landscape Architecture may double count only the following Landscape Architecture courses for their major and this minor: LARCH 060 and LARCH 460W. A grade of C or better is required in all course requirements for the minor.

REQUIREMENTS FOR THE MINOR: 21 credits

PRESCRIBED COURSES (9 credits)
ART H 201(3), ART H 202(3), LARCH 060 GA(3) (Sem: 1-4)

ADDITIONAL COURSES (12 credits)
Select 12 credits from the following list, including at least 6 at the 400 level. No more than 9 credits may be taken from any one department. (Sem: 1-8)
AM ST 415(3)
ARCH 315 GA(3), ARCH 316(3)
ART H 401(3), ART H 404(3), ART H 405(3-6), ART H 411(3-9), ART H 412(3), ART H 415(3), ART H 420(3), ART H 456(3), ART H 458(3), ART H 497(1-9) (if topic is architecture)
CAMS 015 GH(3), CAMS 140 GH(3), CAMS 150 GH(3)
GEOG 102 GH, GEOG 418(3)
HIST 456W(3)
LARCH 460W(3), LARCH 497(1-9) (if topic is history)

ARCHITECTURE STUDIES MINOR

College of Arts and Architecture
The Architecture Studies minor will permit students in other majors the opportunity to gain insight into the discipline of architecture. In addition, the Architecture Studies minor will give students transferring out of the Architecture major the opportunity to receive recognition for their efforts and time spent while in the major. Combined with a degree in another major, it will allow students to work in allied design fields. They may not pursue licensure to practice architecture. Course work includes a design studio, art history, and architecture theory as well as courses from interest areas in digital design and community design.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 21 credits

PRESCRIBED COURSES: (6 credits)
ARCH 110(3) and ARCH 111(3) or ARCH 210(3) and ARCH 211(3) (Sem: 1-2)

ADDITIONAL COURSES: (9 credits)
Select 3 credits from ARCH 101(3)[4], ARCH 130A(3-6)[2], ARCH 131(3)[3], ARCH 132(3)[3], ARCH 231(5)[3], ARCH 232(5)[3], ARCH 441(4)[2], ARCH 442(4)[2] (Sem: 1-8)
Select 6 credits from 400 level (or above) ARCH courses: ARCH 443(1), ARCH 481(3), ARCH 482(3), ARCH 496(1-18), ARCH 497(1-9), ARCH 499C(3), but excluding ARCH 441 and ARCH 442 (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS: (6 credits)
Select 6 credits within Architecture, Art History, Landscape Architecture or Architecture Engineering in consultation with an adviser and the discretion of the ARchitecture Department Head (Sem: 7-8)
[2]Courses available to Architectural Engineering majors only.
[3]Courses available to Architecture majors only.
[4]Students will not be permitted to take ARCH 101 after a 6-credit studio experience in order to increase credits contributing to fulfilling the minor.

ART HISTORY MINOR

College of Arts and Architecture

The minor in Art History provides students with a broad introduction to the history of Western and Eastern art, as well as the opportunity for more specialized study in one or two fields, from ancient to contemporary. Specialized study may concentrate upon one region of the world (i.e. Italian art) or one period (i.e. medieval). A student should seek the advice of her/his minor adviser on course selections. The study of art history develops a student's visual acuity by providing a critical understanding of visual culture in a diversity of societies around the world. Students learn to understand art within the contexts of religion, politics, philosophy, culture, technology, society, and gender. A minor in Art History can be of particular interest for students pursuing careers in art, art education, history, anthropology, archaeology, classics, English, foreign literature, cultural studies, international business, and arts administration. A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 21 credits

PRESCRIBED COURSES: (9 credits)
ART H 111 GA(3), ART H 112 GA(3), and ART H 120 GA;GI(3) (Sem: 1-4)

SUPPORTING COURSES AND RELATED AREAS: (12 credits)
Select 6 credits of 100- to 400-level ART H courses, except ART H 100 GA(3) (Sem: 3-8)
Select 6 credits of 400-level ART H courses (Sem: 3-8)
(Note: Students are encouraged to use these 12 credits to focus their studies in one or two areas of art history and should discuss these course selections with an Art History faculty member.)

ASIAN AREA STUDIES MINOR

College of the Liberal Arts

This is an interdisciplinary minor designed for students with special interests in the Asian area. In addition to the requirements of the student's major department, the minor consists of 21 credits selected from such disciplines as anthropology, art history, economics, geography, history, linguistics, literature, philosophy, political science, religious studies, speech, theatre arts, and appropriate Asian languages. A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 21 credits

PRESCRIBED COURSES (6 credits)
HIST 175 GH;GI(3) (Sem: 3-6)
RL ST 003 GH;GI(3) (Sem: 5-6)

SUPPORTING COURSES AND RELATED AREAS (15 credits)
Select 15 credits, at least 6 at the 400 level, with the approval of the program head. (Sem: 3-8)

ASTROBIOLOGY MINOR

Intercollege

Astrobiology is the study of life in the universe. Astrobiology has become a major focus of scientific research in the United States and a topic often discussed in popular science literature and the general media. The Astrobiology Minor is designed to educate students in this interdisciplinary field covering the varied scientific disciplines that contribute to our general understanding of life, the origin of life, the past history of life on Earth, possible futures for life on Earth, and the possible existence of life in other planetary environments. The principal goal of the minor is to develop student's literacy in astrobiology so that they can critically evaluate claims related to this field that they encounter well after their college education has ended. A grade of C or better is required for all courses in the minor.

REQUIREMENT FOR THE MINOR: 18 credits with at least 6 credits at the 400 level

PRESCRIBED COURSES (3 credits)
BIOL/GEOSC 474(3) (Sem: 5-8)

ADDITIONAL COURSES (9-10 credits)
EARTH 002 GN(3) or GEOSC 021 GN(3) (Sem: 1-6)
ASTRO 140 GN(3) or ASTRO 291 GN(3)(Sem: 5-8)
GEOSC 204(4) or BIOL 427(3)(Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (5-6 credits)
Select 5-6 credits from ASTRO 475W(3), BIOL 405(3), B M B 401(2), B M B 402(3), GEOSC 416(3), GEOSC 419(3), METEO 466(3), or MICRB 201(3) (Sem: 5-8)

ASTRONOMY AND ASTROPHYSICS MINOR

Eberly College of Science

The minor in Astronomy and Astrophysics, available at the University Park campus, provides educational options to students with interest in astronomy but with principal commitments to an allied field. It is designed principally for majors in Aerospace Engineering, Electrical Engineering, Engineering Sciences, Geosciences, Meteorology, and Physics. The educational objectives are to provide students with a profound understanding of the large-scale properties and processes in our universe including planets and solar systems, our sun and other stars, our galaxy and other galaxies; and cosmology. Students in the minor survey the field in the 200-level sequence and then select from a choice of advanced astronomy and allied courses. Minors will be encouraged to take advantage of the many undergraduate research opportunities in the department, often using space-based observatories.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18-19 credits

PRESCRIBED COURSES (6 credits)
ASTRO 291 GN(3), ASTRO 292 GN(3) (Sem: 3-4)

ADDITIONAL COURSES (6-7 credits)
Select 6-7 credits from additional ASTRO 400-level courses, AERSP 308(3), AERSP 312(4), E E 492(3), GEOSC 474(3), GEOSC 481(3), METEO 466(3), or PHYS 458(4) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits from 400-level ASTRO courses, except ASTRO 496 (Sem: 5-8)

BIOCHEMISTRY AND MOLECULAR BIOLOGY MINOR

Eberly College of Science

The Biochemistry and Molecular Biology minor provides a foundation in traditional biochemistry and an exploration of the current understanding of molecular biology. The fields of biochemistry and molecular biology are extensively interconnected and are taught in the context of the biology of the cell. Stated another way, the B M B minor is a substantial treatment of life processes at the molecular and cellular levels. The minor requires course work in general biochemistry, cell biology, and molecular biology. A required laboratory course exposes students to the basic techniques and instrumentation used in modern biochemistry and molecular biology laboratories. Students considering this minor should be comfortable with the study of chemistry.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18-20 credits

PRESCRIBED COURSES: (17 credits)
B M B 251(3), B M B 252(3), B M B 342(3) (Sem: 3-4)
B M B 401(2), B M B 402(3) (Sem: 5-6)

SUPPORTING COURSES AND RELATED AREAS: (1-3 credits)
Select 1-3 credits of B M B courses at the 400-level (Sem: 7-8)

BIOENGINEERING MINOR

College of Engineering

This interdisciplinary minor is designed for students interested in the application of engineering principles to medical and biological problems. Prerequisites for the prescribed and supporting courses include PHYS 201 GN(4), PHYS 202 GN(4), and calculus through differential equations. Students interested in pursuing this minor should contact the Bioengineering program office. A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES: (3 credits)
CHEM 013 GN(3) (Sem: 1-2)

ADDITIONAL COURSES (6 credits)
Select 3 credits of physiology from BIOL 141 GN(3) or BIOL 472(3) (Sem: 3-6)
*Select 3 credits of molecular/cell biology from BIOL 230W GN(4), B M B 251(3), or BIOE 201(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
*Select 6-9 credits of Bioengineering course work from 3-credit courses at the 300, 400, or 500 level (Sem: 5-8)
*Select 0-3 credits of electives from Bioengineering-related courses (department list) or complete an Honors thesis on a bioengineering topic in any department (Sem: 5-8)
*At least 9 credits of bioengineering must be taken.

BIOLOGY MINOR

Penn State Erie, The Behrend College

The minor in Biology (BIOBD) gives students opportunities to combine a background in the biological sciences with other majors. The minor can provide valuable expertise in cross-disciplinary areas, such as mathematical biology, biochemisty, and biophysics; or a biological grounding in fields like psychology or ecology.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (4 credits)
BIOL 110 GN(4) (Sem: 1-4)

ADDITIONAL COURSES (8 credits)
Select 8 credits from BIOL 220W GN(4), BIOL 230W GN(4), or BIOL 240W GN(4) (Sem: 1-4)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits of additional 400-level BIOBD courses, excluding BIOBD 494A(1), BIOBD 494B(1-12), BIOBD 495(3-12) and BIOBD 496(1-18) (Sem: 5-8)

BIOLOGY MINOR

Eberly College of Science

This minor is designed for students who desire to obtain an in-depth and well-rounded knowledge of Biology — the science of life and living organisms. After taking an introductory survey course which exposes students to the basics of Biology, including the chemistry of life, cell structure, genetics, mechanisms of evolution and evolutionary history of biological diversity, plant and animal form and function, and ecology, students select additional courses based on their biological emphasis to account for a total of 18-20 credits. In conjunction with the student's major, the minor prepares students for entry to graduate school or professional school programs, as well as for technical or research careers with governmental agencies or industry. Majors complemented by this minor would include but not be limited to other life and physical sciences, engineering, and business.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18-20 credits

PRESCRIBED COURSES (4 credits)
BIOL 110(4) (Sem. 5-6)

ADDITIONAL COURSES (7-8 credits)
Select 7-8 credits from BIOL 220W GN(4), BIOL 222(3), BIOL 230W GN(4), BIOL 240W GN(4) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (6-9 credits)
Select 6-9 credits from 400-level Biology courses (BIOL 400, BIOL 496, and SC 495 credits may not be used to fulfill this requirement.) (Sem: 5-8)

BLACK DIASPORA STUDIES MINOR

College of the Liberal Arts

The minor in Black Diaspora Studies is designed to broaden the perspectives of students through an examination of the international/transnational dimensions of the experiences of African and African-descent populations, particularly those in the Western Hemisphere. Since the early 16th century, when Europe, the Americas, and Africa were brought into a pattern of sustained interaction following the onset of the Age of European Discovery, the African slave trade and other forms of migration and exchange have been critical to the formative experience of Africans and African-descent populations linked by the Atlantic. The intensity and impact of those exchanges have varied over time, but the presence of Africans and African-descent populations in the evolution of Atlantic civilization constitutes the core of the study of the African diaspora. A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (9 credits)
AAA S 102 GH;DF(3), AAA S 132 DF(3), CMLIT 003 GH;DF(3) (Sem: 1-4)

ADDITIONAL COURSES (9 credits)
Select 9 credits from the following (6 credits must be at the 400 level):
AAA S 201 GS;DF(3), AAA S 208 GA;DF(3) (Sem: 1-4)
AAA S 403(3), AAA S 412 DF(3), AAA S 431 GS;DF(3), CMLIT 422(3), CMLIT 423(3), FR 458 DF(3), HIST 479(3), PL SC 453(3), PL SC 454(3) (Sem: 5-8)

BUSINESS MINOR

Abington College; Berks-Lehigh Valley College: Penn State Berks, Lehigh Valley; Commonwealth College: Penn State Beaver, Delaware County, DuBois, Fayette, Hazleton, Mont Alto, McKeesport, New Kensington, Shenango, Wilkes-Barre, Worthington Scranton, York

This interdisciplinary minor provides students with a business-oriented supplement to their academic major. It is designed to introduce students to a variety of fundamental business skills and knowledge. The minor consists of 22-23 credits, at least 6 credits of which must be at the 400 level. Only courses in which students earn a grade of C or better may be counted toward fulfillment of the requirements for the minor.

REQUIREMENTS FOR THE MINOR: 22-23 credits

PRESCRIBED COURSES: (13 credits)
ACCTG 211(4), ECON 002 GS(3), MGMT 301(3), MKTG 301(3) (Sem: 1-5)

ADDITIONAL COURSES: (3-4 credits)
Select 1 course from the following list:
B A 243(4), B LOG 301(3), FIN 301(3), I B 303(3), MS&IS 200(4) (Sem: 3-8)

SUPPORTING COURSES AND RELATED AREAS: (6 credits)
Select 6 credits at the 400 level in consultation with your adviser and the approval of the director of the business minor (Sem: 5-8)

BUSINESS ADMINISTRATION MINOR

Capital College

This interdisciplinary minor provides students in all majors with a business-oriented supplement to their major fields of study. It is intended to provide a set of basic skills that complement the unique competencies gained in their non-business disciplines. It is strongly recommended that students taking this minor elect at least one course in mathematics through college calculus, and a second course in descriptive and inferential statistics, as part of their General Education requirements or electives for the major. Students taking this minor may not have more than 25 percent of their total credits for graduation in business courses, and must receive a grade of C or better in all courses required for the minor. Students pursuing the Business Administration minor should apply to the School of Business Administration and select business courses in consultation with a business adviser.

REQUIREMENTS FOR THE MINOR: 22 credits

PRESCRIBED COURSES (7 credits)
ACCTG 211(4), MNGMT 310(3) (Sem: 3-4)
ADDITIONAL COURSES (9 credits)
Select 3 credits from ECON 002 GS(3) or ECON 004 GS(3) (Sem: 3-4)
Select 6 credits from B A 243(4) or B LAW 243(3), BUS 305(3), BUS 340(3), BUS 364W GI(3), ECNMS 312(3), ECNMS 313(3), FIN 100(3) or FINAN 320(3), INFSY 390(3), MGMT 321(3), MRKT 221(3) or MRKT 370(3), MRKT 381(3) (course prerequisites must be met)(Sem: 3-8)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits at the 400 level in ACCT, BUS, ECNMS, FINAN, HCM, INFSY, IST, MNGMT, MRKT, or BE SC 408(3), BE SC 410(3), BE SC 468(3), COMMS 416(3), PSYC 421(3), PUBPL 446(3) or other School-approved courses (course prerequisites must be met) (Sem: 5-8)

BUSINESS/LIBERAL ARTS MINOR

Abington College; Commonwealth College; College of the Liberal Arts

This interdisciplinary minor provides students with a business-oriented supplement to their academic major. It is designed to introduce students to a variety of fundamental business skills while at the same time allowing a reasonable degree of flexibility in program emphasis. Only courses in which the student earns a grade of C or better may be counted toward fulfillment of the requirements for the minor.

REQUIREMENTS FOR THE MINOR: 25 credits

PRESCRIBED COURSES (10 credits)
ACCTG 211(4), ECON 002 GS(3), ECON 004 GS(3) (Sem: 3-8)

ADDITIONAL COURSES (15 credits)
(Some courses in this category have prerequisites that are not required in the minor.)
Select 9 credits from B A 250(3), B LAW 243(3), B LOG 301(3), FIN 100(3), INS 301(3), MGMT 100(3), MKTG 221(3), R EST 301(3) (Sem: 3-8)

Select 6 credits from the following: (Sem: 3-8)
ADM J 471(3), ADM J 473(3), any 400-level AG EC course(s), CAS 404(3), CAS 450W(3), CAS 452(3), CAS 471(3), CAS 483(3), COMM 403(3), COMM 405(3), COMM 407(3), COMM 417(3), COMM 421W(3), COMM 424(3), COMM 425(3), COMM 471(3), COMM 473(3), COMM 479(3), COMM 485(3), COMM 487(3), COMM 489(3), COMM 490(3), COMM 491(3), COMM 492, COMM 493(3), any 400-level CSE course(s), any 400-level ECON course(s), ENGL 417(3), ENGL 418(3), ENGL 419(3), ENGL 421(3), FR 408(3), GER 408(3), H P A 420(3), H P A 445(3), H P A 447(3), H P A 455(3), H P A 460(3), HD FS 424(3), HD FS 425(3), HIST 423(3), HIST 425(3), HIST 458W(3), I E 423(3), I E 425(3), any 400-level IST course(s), any 400-level L I R course(s), any 400-level ENNEC course(s), PL SC 412(3), PL SC 416(3), PL SC 417(3), PL SC 419(3), PL SC 420(3), PL SC 444(3), PSY 441(3), PSY 451(3), PSY 461(3), R P M 410(3), R P M 415(3), R P M 470(3), SOC 404(3), SOC 422(3), SOC 444(3), SOC 455(3), SOC 456(3), SOC 473(3), SPAN 412(3), any 400-level STAT course(s), TURF 436W(3)

BUSINESS LOGISTICS MINOR

Smeal College of Business

The Business Logistics minor is structured to provide the student with a working knowledge of the discipline and to complement a student's major field of study. Because Business Logistics crosses both functional and organizational boundaries in business, it is an appropriate minor for non-logistics majors within The Smeal College as well as for students in other majors.

The B LOG minor provides exposure to basic business principles along with logistics and supply chain concepts. Because of the importance of transportation links in supply chains, the minor also requires a course on domestic and international freight transportation systems. Students within the minor may pursue supporting courses in Business Logistics, covering topics such as e-fulfillment and operations, strategic procurement, transportation management and policy, urban transportation, and international logistics. To be successful in the B LOG minor, the student must, at a minimum, possess a working knowledge of quantitative techniques and an understanding of basic economic principles.

Because Business Logistics is common to many industries, students graduating with a minor in Business Logistics can apply their expanded knowledge in areas such as agriculture, health care, manufacturing, wholesaling, retailing, minerals and petroleum production, civilian and military government agencies, consulting, and food and hotel services.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES: (6 credits)
ECON 002 GS(3), B LOG 320(3) (Sem: 5-6)

ADDITIONAL COURSES: (12 credits)
Select 6 credits from a or b:
a) Business Majors: BA 303(3), B LOG 305(3)
b) Non-Business Majors: B LAW 243(3), B LOG 301(3)
Select 6 credits from B LOG 405(3), B LOG 410(3), B LOG 415(3), B LOG 430(3), B LOG 432(3), or B LOG 455(3) (Sem: 5-8)

CHEMICAL ENGINEERING MINOR

College of Engineering

The job of the chemical engineer is to develop applications utilizing the most recent advances in the sciences, including chemistry, biology and materials science. The chemical engineering curriculum provides students with the knowledge and skill necessary to solve the problems of taking work from the small scale of the laboratory to actual implementation and construction.

While science disciplines emphasize the facts and principles of science, chemical engineering emphasizes its practical application on an industrial scale.

The chemical engineering curriculum covers such fundamentals as stoichiometry and materials balances, heat and mass transfer, thermodynamics, fluid dynamics, chemical equilibrium and reaction rates, economics, optimization, and control. The emphasis of the curriculum is placed on the utilization of these fundamental principles to analyze, design, construct, and operate processes in a diversity of fields, including the chemical, petroleum, food, polymer, pharmaceutical, electronic, and materials industries.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 19 credits

PRESCRIBED COURSES: (19 credits)
CH E 301(3), CH E 302A(3), CH E 302B(2), CH E 303(3), CH E 304(2) (Sem: 3-6)
CH E 413(3), CH E 414(3) (Sem: 5-6)
(Note: If a student exempts any listed course(s) because of prior studies in another area or university, CH E 401(3) or CH E 407W(3) may be used to substitute credit to maintain the minimum 19-credit requirement.)

CHEMISTRY MINOR

Penn State Erie, The Behrend College

The minor in Chemistry (CHMBD) complements degrees in other areas of physical science and introduces students to fundamental principles of chemistry through general chemistry, organic chemistry, analytical chemistry, and selected 400-level courses of their choice.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18-20 credits

PRESCRIBED COURSES: (12 credits)
CHEM 036(2), CHEM 038(3), CHEM 039(3) (Sem: 3-6)
CHMBD 221(4) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS: (6-8 credits)
Select at least 6-8 credits of 400-level CHMBD, excluding CHMBD 494(1-12), CHMBD 495(1-18), and CHMBD 496(1-18) (Sem: 5-8)

CHEMISTRY MINOR

Eberly College of Science

The Chemistry minor specifies a series of courses that together provide a broad introduction to the main thrusts of modern chemistry: general, organic, and physical. The Chemistry minor includes substantial laboratory work including general chemistry and either organic or physical chemistry. In addition, several advanced courses chosen by the student from a list of options are required.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 27-28 credits

PRESCRIBED COURSES: (20 credits)
CHEM 012 GN(3), CHEM 013 GN(3), CHEM 014(1), CHEM 015 GN(1), CHEM 038(3), CHEM 039(3) (Sem: 1-4)
CHEM 451(3), CHEM 452(3) (Sem: 5-8)

ADDITIONAL COURSES: (7-8 credits)
Select 2 credits from CHEM 036(2) or CHEM 457(2) (Sem: 3-8)
Select 5-6 credits from CHEM 402(3), CHEM 405(3), CHEM 408(3), CHEM 410(3), CHEM 411(3), CHEM 425(3), CHEM 426(3), CHEM 431W(3), CHEM 439(3), CHEM 448(3), CHEM 453(3), CHEM 454(3), CHEM 455(3), CHEM 457(2), if not used in above category, or CHEM 463(3)

CHINESE LANGUAGE MINOR

College of the Liberal Arts

The Chinese Language minor is intended to provide students with a good working knowledge of the Chinese language, taught in a context that emphasizes the characteristics and diversity of Chinese culture and society. Students undertake three years of language study (or equivalent); education abroad can be included.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 21 credits

PRESCRIBED COURSES: (12 credits)
CHNS 001(4), CHNS 002(4), CHNS 003(4) (Sem: 1-4)

ADDITIONAL COURSES: (9 credits)
Select 3 credits from CHNS 110(3), CHNS 296(1-18), CHNS 297(1-9), CHNS 299 GI(1-12) (Sem: 1-8)
Select 6 credits from CHNS 401(3), CHNS 402(3), CHNS 496(1-8), CHNS 497(1-9), or CHNS 499 GI(3-12) (Sem: 5-8)

CLASSICS AND ANCIENT MEDITERRANEAN STUDIES MINOR

College of the Liberal Arts

The CAMS minor recognizes the completion of a broadly interdisciplinary study of the cultures of the ancient Mediterranean world through 18 credits of course work, including 6 credits at the 400-level. The courses offered are concerned with the cultures of the ancient Near East, Egypt, and Mesopotamia, Greece, and Rome in such fields as civilization, archaeology, history, philosophy, religion, and mythologies. Students who complete the Penn State Athens Education Abroad Program and its prerequisite course may apply to receive the minor. Students in the minor may also receive credit for participating in approved archaeological fieldwork in the Mediterranean region. While the study of language is not required, students are encouraged to study the

appropriate ancient languages. The minor is especially suitable for students in such fields as history, medieval studies, anthropology, literature, philosophy, and education.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

SUPPORTING COURSES AND RELATED AREAS: (18 credits)
Select 12 credits from CAMS courses (Sem: 1-8)
Select 6 credits of 400-level CAMS courses (Sem: 5-8)

CLIMATOLOGY MINOR

College of Earth and Mineral Sciences

Climate is a central component of the physical environment, playing an important role in a wide range of human activities. The ability to force changes in the global climate system may be one of the more significant ways in which human society will impact Earth's physical environment in the near future. The climatology minor in the College of Earth and Mineral Sciences is an interdisciplinary program drawing from the fields of Meteorology, Geography, and Geosciences. The minor provides an overview of the physical processes that control present-day climate. It also provides an introduction to the history of climate change through geologic time, and presents some of the causes and consequences of potential future climate change and variability.

REQUIREMENT FOR THE MINOR: 18 credits

ADDITIONAL COURSES (18 credits)
Select 18 credits from:
EARTH 103 GN(3) (Sem: 1-8)
GEOG 408W(3), GEOG 432W(3), GEOG 433W(3), GEOG 437(3), GEOSC 320(3), METEO 300(3) (Sem: 5-8)

COMMUNICATION MINOR

Penn State Erie, The Behrend College

This minor requires 18 credits, at least 6 at the 400 level. Students should select these 18 credits in consultation with their academic adviser and the person in charge of the minor in such a way as to complement their chosen major.

Many Business Liberal Arts and Sciences (BLASC) majors select the Communication minor as one of their three modules.

The minor in Communication serves as an excellent complement to majors in Humanities and Social Sciences such as English and Political Science, as well as those in the School of Business such as Management Information Systems and Business Management.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

SUPPORTING COURSES AND RELATED AREAS: (18 credits)
Select 12 credits from COMM, COMMU, and CAS courses [excluding COMM 100 GS(3), COMM 150(3), COMM 250 GA(3), COMMU 001(1), COMMU 002(2-3), COMMU 003(1), and CAS 100 GWS(3)] (Sem: 1-6)
Select 6 credits of 400-level COMM, COMMU, and CAS courses (Sem: 3-8)

COMMUNICATION ARTS AND SCIENCES MINOR

Abington College; Berks-Lehigh Valley College: Penn State Berks; Commonwealth College: Penn State Delaware County, York; College of the Liberal Arts

This minor provides understanding and practice in the ways humans achieve their personal and career goals by means of communication. Students may choose any of the department's pathways of specialization, such as Interpersonal, Family, Intercultural, Organizational, Legal, Political Communication and Presentation Skills, Communication and Technology, or Rhetoric. For example, Legal Communication focuses on communication within the legal system, and provides students with the theory and skills to understand the uses, evaluation, and structure of public policy and legal disputes. Students learn how perception, meaning, and conflict function in human communication if they choose to specialize in Interpersonal Communication, while Organizational Communication critically examines leadership, decision-making, interviewing, and teamwork in formal organizations. In coordination with an adviser, a student of any major may tailor this minor to complement his or her educational and career goals by pursuing a particular pathway.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

ADDITIONAL COURSES (6 credits)
Select 3 credits from CAS 203(3), CAS 205(3), CAS 211(3), CAS 213(3), CAS 214(3), CAS 215(3), CAS 252(3), CAS 271 GI(3), CAS 280W(3), or CAS 250(3) or CAS 283(3) (Sem: 3-6)
Select 3 credits from CAS 200(3), CAS 201 GH(3), or CAS 202(3) (Sem: 3-8)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 6 credits of Communication Arts and Sciences courses (Sem: 1-8)
Select 6 credits of Communication Arts and Sciences courses at the 400 level (Sem: 1-8)
Note: CAS 100 GWS(3), CAS 126(3), or CAS 195(1) may not be counted as part of the minor.

COMMUNICATIONS MINOR

Altoona College
This Communications minor provides students an academic program of media studies that introduces them to approaches used to understand the mass media. These include aesthetic, cultural, humanistic, social-behavioral, and legal approaches. Students in the minor will have an opportunity to examine the theory and principles of communications systems and processes as well as learn in the advanced courses the research methods used for their systematic analysis. The minor emphasizes the liberal arts core of the Communications program and will equip students with well-developed language and analytical skills.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (6 credits)
COMM 100 GS(3), COMM 150 GA(3) (Sem: 1-2)

ADDITIONAL COURSES (12 credits)
(At least 6 credits must be at the 400 level.)
COMM 180(3), COMM 205 GI(3), COMM 250 GA(3), COMM 261 GH(3), COMM 320(3), COMM 370(3) (Sem: 3-4)
COMM 401(3), COMM 403(3), COMM 408(3), COMM 409(3), COMM 411(3), COMM 413(3) (Sem: 5-8)

COMPUTER ENGINEERING MINOR

Penn State Erie, The Behrend College
This program of study provides graduates with a strong background in computer engineering. Upon completion of the minor, graduates will have developed an understanding of the operation and design of computers. This objective is accomplished through a combination of classroom study, computer-related projects, and laboratory experience. Analysis and design of computer hardware and software systems are stressed. The program requires completion of mandatory courses in analog and digital circuits, microprocessors, transistor logic, and computer programming. Students complete the minor by selecting technical electives in computer hardware and software engineering.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 24 credits

PRESCRIBED COURSES: (11 credits)
E E 210(4) (Sem: 1-4)
EE BD 324(4), EE BD 421(3) (Sem: 5-6)

ADDITIONAL COURSES: (13 credits)
Select 3 credits from CMPSC 201C GQ(3) or CMPSC 201F GQ(3) (Sem: 1-4)
Select 4 credits from CSE 271(3) and CSE 275(1) or EE BD 325(4) (Sem: 5-6)
Select 6 credits from CENBD 431(3), CENBD 451W(3), CENBD 453(3), CENBD 455(3), CENBD 461(3), CENBD 463(3), CENBD 465(3), CENBD 467(3), or EE BD 422(3)

COMPUTER SCIENCE MINOR

Capital College
A of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18-21 credits

PRESCRIBED COURSES: (9 credits)
COMP 410(3), COMP 432(3), and MA SC 370(3) (Sem:4-8)

ADDITIONAL COURSES: (3-6 credits)
CSE 120(3) [or both COMP 350(3) and COMP 351(3)]

SUPPORTING COURSES AND RELATED AREAS: (6 credits)
Select 6 credits of 400-level COMP courses from approved department list. (Sem: 5-8)

COMPUTER SCIENCE MINOR

Penn State Erie, The Behrend College

The Computer Science minor at Penn State Erie is designed to allow students in any Behrend major to establish a strong conceptual framework in computer science, so they can apply computer science methods and techniques to their primary field of study. Students begin by taking two courses in computer programming (CSE 103 and CSE 120), a course in Object-Oriented Design (CMPBD 360), and a course in discrete math for computer science (CSE 260). These 13 credits are followed with an additional 6 credits of 400-level work in computer science at Behrend (CMPBD). (Please note that MATH 140 is a prerequisite for CSE 120, so students whose majors do not require MATH 140 must be sure to schedule it in place of or in addition to the math courses required by their majors.)

Computing has become a critical aspect of most disciplines. This minor provides students with the opportunity to develop computing expertise which can then be applied to their field of study, thus enhancing job placement opportunities after graduation or better preparing the student to pursue graduate work in computing intensive sub-disciplines of their major. The emphasis is on building a conceptual framework which will allow the student to continue to learn new computing techniques beyond graduation in this rapidly evolving discipline.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 19-20 credits

PRESCRIBED COURSES (10 credits)
CMPBD 127(1), CSE 120(3) (Sem: 3-4)
CMPBD 360(3), CSE 260(3) (Sem: 3-6)

ADDITIONAL COURSES (3-4 credits)
Select 3-4 credits from CMPBD 204(4), CMPSC 201C GQ(3), CMPSC 201F GQ(3), or CSE 103 GQ(4) (Sem: 3-8)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits of 400-level (below 490) CMPBD courses (Sem: 7-8)

CRIMINAL JUSTICE MINOR

Altoona College

The Criminal Justice minor provides an overview of the criminal justice system and a thorough grounding in criminological theory. Students receive an in-depth look at the three main system components: policing, courts, and corrections, as well as the opportunity to delve into two or more specialized topics relating to criminal justice. The minor is designed not only for students who have a professional interest in criminal justice, but also for those who want to be informed members of the voting citizenry. A functional understanding of crime and the criminal justice system is useful in many careers, including law, social work, education, and journalism.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES: (12 credits)
CJ 100(3) (Sem:1-4)
CJ 210(3), CJ 220(3), CJ 230(3) (Sem: 3-6)

SUPPORTING COURSES AND RELATED AREAS: (6 credits)
Select 6 credits of 400-level CJ courses, excluding CJ 495(1-18) (Sem: 7-8)

DANCE MINOR

College of Arts and Architecture

This minor is a rigorous program designed to help students who wish to further their skills in this art form. Students choose from a variety of options to create their own dance minor that will give them the tools and the knowledge to further their individual interest in the field. Upon completion of this minor, the student will be able to pick from a variety of career opportunities such as performance, teaching, choreography, production, and studio or have it apply to their major. Eighteen credits are required for completion of the Dance minor with a minimum of 6 credits at the 400 level.

Entrance into the Dance minor will be based on an audition at the beginning of every fall semester. The audition will consist of a ballet barre and combinations in ballet, jazz, and modern. Ability to pick up and execute technique and combinations is essential. A grade of C or better is required in all courses required in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (5 credits)
DANCE 301(2) (Sem: 3-6)
DANCE 484(3) (Sem: 5-8)

ADDITIONAL COURSES (10 credits)
Select 2 credits from DANCE 231(1), DANCE 232(1), DANCE 331(1), DANCE 332(1), DANCE 431(1), DANCE 432(1) (Sem: 1-4)
Select 2 credits from DANCE 261(1), DANCE 262(1), DANCE 361(1), DANCE 362(1), DANCE 461(1), DANCE 462(1) (Sem: 1-4)
(These courses may not double count for other dance minor requirements.)
Select 4 credits from the following courses:
DANCE 231(1), DANCE 232(1), DANCE 241(1), DANCE 242(1) (Sem: 1-4)
DANCE 251(1), DANCE 252(1), DANCE 261(1), DANCE 262(1) (Sem: 1-4)
DANCE 331(1), DANCE 332(1), DANCE 341(1), DANCE 342(1), DANCE 351(1), DANCE 352(1), DANCE 361(1), DANCE 362(1) (Sem: 1-6)
DANCE 431(1), DANCE 432(1), DANCE 441(1), DANCE 442(1) (Sem: 5-8)
DANCE 451(1), DANCE 452(1), DANCE 461(1), DANCE 462(1) (Sem: 5-8)
(All dance minors are required to demonstrate proficiency at beginning level technique courses before selecting the intermediate or advanced level courses.)
Select 2 credits from:
DANCE 381(1), DANCE 382(1) (Sem: 1-8)
DANCE 480(1), DANCE 485(1) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (3 credits)
Select 3 credits from:
DANCE 280(1), DANCE 281(1), DANCE 296(1-18), DANCE 297(1-9), DANCE 380(2), DANCE 385(2) (Sem: 1-6)
THEA 100 GA(3), THEA 102 GA(3), THEA 114(3), THEA 146(2), THEA 150(3), THEA 189(1-6), THEA 208 GA;GI(3) (Sem: 1-8)
DANCE 270 GHA(3), DANCE 482(3), DANCE 496(1-18), DANCE 497(1-9), THEA 408(3) (Sem: 5-8)

DANCE STUDIES MINOR

Altoona College

The Dance Studies Minor is designed for students interested in furthering their study and exploration of the many areas of dance—the various techniques: ballet, modern, jazz, the creative process and performance, and movement theories. It is also designed to enhance various career opportunities for those majoring in areas such as Integrative Arts, Education, Business, Psychology, and others. Optional directions include areas such as dance therapy and dance medicine with graduate study, or performance, teaching, production, studio or company management, and choreography. Twenty-one credits are required for completion of the minor with a minimum of 7 credits at the 400 level.

A grade of C or better is required in all courses in the minor.

REQUIREMENTS FOR THE MINOR: 21 credits

PRESCRIBED COURSES (11 credits)
DANCE 270 GHA(3), DANCE 301(2) (Sem: 2-6)
DANCE 482(3), DANCE 484(3) (Sem: 4-8)

ADDITIONAL COURSES (10 credits)
DANCE 432(1), DANCE 442(1), or DANCE 462(1) (Sem: 4-8)
Select 6 credits from Dance Technique courses:
DANCE 231(1), DANCE 232(1), DANCE 241(1), DANCE 242(1), DANCE 261 GA(1), DANCE 262(1) (Sem: 1-4)
DANCE 331(1), DANCE 332(1), DANCE 341(1), DANCE 342(1), DANCE 361(1), DANCE 362(1) (Sem: 3-6)
DANCE 431(1), DANCE 441(1), DANCE 461(1) (Sem: 4-8)
(All Dance Studies minor students are required to demonstrate proficiency at beginning level technique courses before placement in the intermediate or advanced courses.)
Select 3 credits from Creative Process/Performance courses:
DANCE 280(1), DANCE 296(1-18) (Sem: 1-6)
DANCE 381(1) (Sem: 3-6)
DANCE 485(1) (Sem: 3-8)
DANCE 382(1), DANCE 496(1-18), DANCE 497(1-9) (Sem: 4-8)

DIGITAL ARTS AND INFORMATION SCIENCES AND TECHNOLOGY

College of Arts and Architecture; School of Information Sciences and Technology
PROGRAM CURRENTLY ON HOLD: NOT ACCEPTING NEW STUDENTS

NOTE: The DEAFNESS AND HEARING STUDIES MINOR (Health and Human Development) was added after press deadline. See www.psu.edu/bulletins/bluebook.

DISPUTE MANAGEMENT AND RESOLUTION MINOR

College of the Liberal Arts
This interdisciplinary minor administered by the Departments of Communication Arts and Sciences and Labor Studies and Industrial Relations provides students with the opportunity to learn about, and develop skills appropriate to, the management and resolution of problems created by difference in attitudes, beliefs, values, and behavioral preferences of individuals primarily in interpersonal, group, and organizational contexts, and, to a lesser extent, international contexts. The minor is supportive of, and complementary to, work emphasizing conflict and means for dealing with it in such majors as Administration of Justice, Communication Arts and Sciences, Human Development and Family Studies, Labor and Industrial Relations, Political Science, Psychology, and Sociology. Students pursuing the minor must complete nine credits of prescribed course work and nine credits of additional course work distributed across at least two of the eight areas identified below. Of the 18 credits selected, at least nine must be at the 400 level, six must be from Communication Arts and Sciences, and six must be from Labor and Industrial Relations. A maximum of six credits earned in the minor, if appropriate, can be used to satisfy requirements in the Communication Arts and Sciences or Labor and Industrial Relations majors. Only courses in which the student earns a grade of C or better may be counted toward fulfillment of requirements for the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (6 credits)
CAS 203(3), L I R 100 GS(3) (Sem: 3-6)

ADDITIONAL COURSES (12 credits)
(Select 12 credits of which 9 credits must be taken at the 400 level)
Select 3 credits from L I R 404(3) or SPCOM 404(3) (Sem: 5-8)
Select 9 credits from ADM J (WMNST) 423 DF(3), CAS 250(3), CAS 403(3), CAS 452(3), CAS 471 DF(3), HD FS 311(3), HD FS 414(3), L I R (WMNST) 136 DF(3), L I R 411(3), L I R 414W(3), L I R 434(3), PL SC 014 GS(3), PL SC 418(3), PL SC 437(3), PSY 231 GS(3), PSY 441(3), PSY 475(3), SOC 119 GS;GI(4), SOC 403(3), SOC 432(3), SOC 455(3), S T S 090(3), S T S 390(3) (Sem: 5-8)

EARTH SYSTEMS MINOR

College of Earth and Mineral Sciences
The recognition that environmental problems are global in extent, and impact on many different components of the Earth System simultaneously, requires that we adopt a large-scale and interdisciplinary approach to questions of global change and the interactions of the physical and human environments. The Earth Systems minor follows such an approach and offers undergraduates the opportunity to study the Earth as an integrated system. The Earth Systems minor is a science minor offered through the College of Earth and Mineral Sciences. It provides a wider interdisciplinary perspective for majors in the traditional Earth Science disciplines (geography, geoscience, and meteorology), and provides an introduction to Earth Sciences and a broad exposure to Earth Systems/Environmental Studies for other science and engineering majors. Students may apply up to 6 credits from courses in the major department to satisfy the minor requirements. A grade of C or better is required for all courses in the minor.

REQUIREMENT FOR THE MINOR: 18 credits

PRESCRIBED COURSES (3 credits)
EARTH 002(3) (Sem: 3-6)

ADDITIONAL COURSES (6 credits)
Select 6 credits from EARTH 103 GN(3), EM SC 470W(3-6), GEOG 406(3), GEOSC 310(4), or METEO 300(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 9 credits from the Earth Sytems Committee's approved list of courses (Sem: 5-8)

ECONOMICS MINOR

Penn State Erie, The Behrend College
A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (6 credits)
ECON 002 GS(3), ECON 004 GS(3) (Sem: 1-6)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 6 credits from BECON, ECNS, or ECON courses (Sem: 3-6)
Select 6 credits of 400-level BECON, ECNS, or ECON courses (Sem: 3-8)

ECONOMICS MINOR

College of the Liberal Arts
A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (12 credits)
ECON 002 GS(3), ECON 004 GS(3) (Sem: 3-4)
ECON 302 GS(3), ECON 304 GS(3) (Sem: 5-6)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits of additional ECON courses at the 400-level (Sem: 5-8)

EDUCATION POLICY STUDIES MINOR

College of Education
This minor is designed to introduce students to the fundamental tenets of education policy development and analysis in both the U.S. and other countries. Students pursuing the minor may choose from courses on educational policy in the areas of higher education, educational administration, educational theory and policy, Native American education leadership and comparative/international education. The minor consists of a multidisciplinary program of study in areas of education related to numerous policy issues including social sciences, history, management sciences, and/or humanities. It is anticipated that students completing the minor will find these studies can enrich any major degree program and potentially provide opportunities for employment and/or graduate studies in state departments of education, ministries of education, federal and international education agencies, academic institutions, and various professional associations.

This 18-credit minor may be combined with any undergraduate major at Penn State. A grade of C or better is required for all courses taken in fulfillment of the minor. No prerequisites are required for the minor.
REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (6 credits)
EDTHP 115(3), EDPSY 014(3) (Sem: 1-4)

ADDITIONAL COURSES (12 credits)
Select 12 credits from: CI ED 470(3), EDLDR 476(3), EDLDR 480(3), EDLDR 481(3), EDTHP 401(3), EDTHP 411 DF(3), EDTHP 416(3), EDTHP 430(3), EDTHP 440(3), EDTHP 441(3), EDTHP 496(1-18) (Sem: 5-8)

ELECTRONIC AND PHOTONIC MATERIALS MINOR

College of Earth and Mineral Sciences
Electronic and photonic materials have greatly changed modern life. Without them, computers, telecommunication systems, compact disc players, video cameras, and all the electronics with which we have become accustomed would not be possible. The study of electronic and photonic materials is a natural bridge between the fields of electrical engineering and material science. Students in electrical engineering will benefit from this minor because they will better understand the materials with which they will design electronic and photonic devices, such as transistors on a computer chip or semiconductor lasers in a compact disc player. Training in the field of electronic and photonic materials requires study of the processing and characterization of these materials to help engineers develop ways to lower cost and improve performance. This knowledge will help prepare students to enter the semiconductor industry or pursue graduate studies.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (6 credits)
MATSE 201(3) (Sem: 1-4)
E E 418(3) (Sem: 5-8)

ADDITIONAL COURSES (12 credits)
Select 3 credits from E SC 314(3) or an approved E E course (Sem: 1-4)
Select 3 credits from MATSE 450(3) or MATSE 455(3) (Sem: 5-8)
Select 6 credits from E E 419(3), E SC 445(3), MATSE 400(3), MATSE 401(3), MATSE 402(3), MATSE 413(3), MATSE 417(3), MATSE 430(3), MATSE 435(3), MATSE 450(3), MATSE 455(3) (Sem: 5-8)

ENERGY, ENVIRONMENTAL, AND MINERAL ECONOMICS MINOR

College of Earth and Mineral Sciences

This minor has a set of courses focusing on economic issues in energy, risk management, and the environment. The field helps prepare students for careers in industry, government, financial institutions, and non-profit organizations dealing with energy and resource issues. The curriculum provides a strong base for further study in business, economics, law, and social science.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (15 credits)
ENNEC 100 GS(3) (Sem: 1-2)
ECON 302(3), EM SC 301(3) (Sem: 3-6)
ENNEC 473(3), ENNEC 484W(3) (Sem: 6-8)

ADDITIONAL COURSES (3 credits)
Select 3 credits from GEOG 406(3), GEOG 410(3), GEOG 470(3) (Sem: 6-8)

ENGINEERING ENTREPRENEURSHIP MINOR

College of Engineering

This interdisciplinary minor supports technology entrepreneurship development for all students, especially those majoring in engineering, business, and IST (Information Sciences and Technology). All segments of the U.S. and world economy are integrated with technology. The Engineering Entrepreneurship Minor addresses this new reality. Engineering graduates should have more business finance, marketing, and intellectual property knowledge, and business and IST students interested in technology enterprises should have a working knowledge of the engineering design process, basic engineering principles, graphics, and computer-aided design. All students should have solid skills in teamwork, leadership, and innovation in order to conceive, produce and promote creative product designs and solutions. Courses in the minor use problem-based learning, including business case studies and new product concept prototyping. Core courses include business plan presentations and competitions and open-ended design problems. The minor consists of 18 semester hours. A grade of C or better is required in all classes used to meet the requirements of the minor. For admission to the minor, students must have completed ENGR 310(3) Entrepreneurial Leadership.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (9 credits)
ENGR 310(3) (Sem: 4-6)
ENGR 407(3) (Sem: 5-7)
ENTR 430(3) (Sem: 6-8)

ADDITIONAL COURSES (3 credits)
Select one course from the list below:
ENGR 411(3) for non-business students (Sem: 5-7)
QMM 492(3) for non-engineering students (Sem: 5-7)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits from approved department list or in consultation with the coordinator of the Engineering Entrepreneurship Minor (Sem: 5-8)

ENGINEERING LEADERSHIP DEVELOPMENT MINOR

College of Engineering

This interdisciplinary minor is designed to provide engineering students with critical principles and skills. Engineering graduates must demonstrate the ability to assume leadership roles in a competitive technologically complex global society. There are increasing demands for engineers to be able to deal effectively with other

people, including the ability to work in teams and to interact with customers and other organizations on both national and international levels. Students will employ engineering case studies in active and collaborative classroom settings to develop these skills. The minor consists of 18 semester hours. A grade of C or better is required in all minor courses. Students in all engineering majors are eligible. For admission to the minor, students must have completed ENGR 408(2). Students should apply during their sophomore year.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (9 credits)
ENGR 409(3) (Sem: 5-6)
ENGR 408(2) (Sem: 5-8)
ENGR 493(1), S T S 460(3) (Sem: 7-8)

ADDITIONAL COURSE (3 credits)
B A 250(3) or ENGR 407(3) (Sem: 5-6)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits in consultation with the coordinator of the Engineering Leadership Development Minor (Sem: 5-8)

ENGINEERING MECHANICS MINOR

College of Engineering

The Engineering Mechanics minor prepares students to analyze and/or design simple structures that are efficient and safe under foreseen loading conditions.

Contemporary engineering design of mechanical components requires precise information and modern analysis techniques to determine material response to anticipated loading. Designers must have the analytical and experimental tools to accurately define deformation under load to characterize dynamic response and to prevent mechanical failure. In the event of failure the cause(s) must be ascertained to prevent future failure through redesign and/or material substitution. Thus, industry has a real need for those with a sound foundation in Engineering Mechanics, the engineering science that deals with the effects of forces and torques on rigid and deformable bodies. Engineering Mechanics consists of Statics (bodies in equilibrium), Dynamics (bodies in unsteady motion such as vibration, moving on curvilinear paths) and the Mechanics of Deformable Media. The latter topic covers the change in dimensions of bodies of various shapes under the influence of forces, torques, temperature, and dynamic motion. Further failure criteria under such loadings are introduced and utilized in examples of engineering design. Some twenty undergraduate courses covering the above topics are available at two levels, i.e. sophomore introductory and senior (400) courses.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits
SUPPORTING COURSES AND RELATED AREAS: (18 credits)
Select 12 credits of E MCH courses, which may include: E MCH 011(3), E MCH 012(3), E MCH 013(3), E MCH 215(2), E MCH 216(1) (Sem: 1-4)
Select 6 credits from 400-level E MCH courses (Sem: 5-8)

ENGLISH MINOR

Abington College; Altoona College; Commonwealth College: Penn State Delaware County, Fayette, McKeesport, Mont Alto, New Kensington, York; College of the Liberal Arts

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

SUPPORTING COURSES AND RELATED AREAS: (18 credits)
Students may not count courses used to satisfy General Education Writing/Speaking Skills
Select 6 credits from ENGL 200-289 (Sem: 3-8)
Select 6 credits from ENGL 400-493 (Sem: 3-8)
Select 6 additional credits in English (Sem: 3-8)

ENGLISH MINOR

Penn State Erie, The Behrend College

For the English English minor at Penn State Erie, the student must take (beyond the basic General Education) 18 credits of courses in ENGL or ELISH; 6 of these credits must be at the 400 level. The student is encouraged to take courses from each of the areas within the major (The Canon and Its Critics, Globality and Literature, Cultural Studies), as well courses in creative writing. By doing so, students will develop skills in writing and critical thinking that will prove valuable in their later work experiences.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

SUPPORTING COURSES AND RELATED AREAS (18 credits)
Select at least 12 credits from ENGL or ELISH 200-289 [Students may not count courses used to satisfy General Education Writing/Speaking Skills] (Sem: 1-6)
Select at least 6 credits from ENGL or ELISH 400-493

ENTREPRENEURSHIP MINOR

Altoona College

Entrepreneurship plays a crucial role in the way new ideas, opportunities, inventions, and technologies are created and introduced into the global marketplace. Students in this minor first develop an understanding of financial forces that affect business ventures. The minor then provides them with a core of courses that enhance their major field of study and that provide a background sufficient for them to take advantage of many entrepreneurial opportunities.

A grade of C or better is required in all courses for the minor.

REQUIREMENTS FOR THE MINOR: 19 credits

PRESCRIBED COURSES (13 credits)
ACCTG 211(4), ECON 002 GS(3) (Sem: 1-4)
ENTR 300(3), ENTR 320(3) (Sem: 5-7)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 3 credits at the 400-level from entrepreneurship (Sem: 7-8)
Select 3 credits of ENGL 419(3) or any 400-level Business or Economics course (Sem: 7-8)

ENVIRONMENTAL ENGINEERING MINOR

College of Engineering

This minor is designed to provide students in engineering, science, and other majors with a comprehensive study of environmental issues and the skills necessary to solve problems associated with environmental pollution. A certificate is awarded to students who complete the requirements of the minor.

For entrance into the minor, students must be at least fifth-semester standing and have completed CHEM 012 GN(3), MATH 141 GQ(4), PHYS 211 GN(4). A minimum of 2.0 is mandatory for certification.

The minor consists of 18 credits, at least 6 of which must be at the 400 level. A grade of C or better is required in all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits
(2 credits of engineering design are included)

PRESCRIBED COURSES (3 credits)
C E 370(3) (Sem: 3-6)

ADDITIONAL COURSES (15 credits)
Select 3 credits from: BIOL 230W GN(4), CHEM 034(3), CHEM 038(4), C E 479(1), and MICRB 400(2) (Sem: 3-8)
Select 3 credits from: AG E 435(3), CH E 301(3), MN PR 301(3), NUC E 307(3), or NUC E 430(3) (Sem: 5-8)
Select 3 credits from: AERSP 308(3), C E 371(3), M E 033(3), METEO 454(3), or NUC E 431W(4) (Sem: 5-8)
Select 6 credits (including at least 2 of engineering design) from: A S M 457(3), C E 472W(3), C E 475(3), C E 476(3), E R M 411(3), E R M 412(3), E R M 413W(3), F SC 430(3), GEOSC 452(3), M E 405(3), M E 470(3), MN PR 427(3), MNG 444(2), MNG 445(3), NUC E 405(3), NUC E 420(3), NUC E 428(3), or P N G 405(3) (Sem: 5-8)

ENVIRONMENTAL INQUIRY MINOR

Intercollege

This intercollege intercollege minor is designed for students across the disciplines who wish to prepare for addressing environmental issues or problems as professionals or citizens. The minor is available to all undergraduates regularly enrolled in a degree program at the University. The objectives are to allow students to gain the multiple perspectives necessary for understanding environmental issues as well as to increase skills in collaborating with those from very different disciplinary backgrounds to find acceptable solutions. Students will be challenged to move beyond the channels of thinking characteristic of their own discipline to new ways of knowing, new sensitivities, and new analytical approaches. The program will engage students actively in learning experiences outside their major course of study. This minor is intended not to replace existing minors but to be a true intercollege, interdisciplinary minor. A grade of C or better is required for all courses in the minor.

Advising for students in this minor and approval of curriculum exceptions will be available through the Environmental Inquiry Adviser designated within each participating college.

REQUIREMENTS FOR THE MINOR: 18 credits

ADDITIONAL COURSES (15 credits)
Select 3 credits from BI SC 003 GN(3), BIOL 110 GN(3), E R M 210 GN(3), EARTH 002 GN(3), EARTH 100 GN(3), ENGL 180 GH(3), GEOG 030 GS(3), GEOSC 040 GN(3), HIST 151 GS(3)/S T S 151 GS(3), PHIL 118 GH(3), PL SC 135 GS(3)/S T S 135 GS(3), SOC 023 GS(3), SOC 047(3)/S T S 047(3), W F S 209 GN(3) (Sem: 1-4)

Select 9 credits from one of the following five available clusters a, b, c, d, e (students may not use a course from their major in their chosen cluster):

a.Living on Earth: Biodiversity and Ecosystems
BIOL 220W GN(4), BIOL 417(4), BIOL 435(3), BIOL 482(4), BIOL 499A(3), CHEM 102(3), CHEM 402(3), FOR 308(3), GEOG 105(3), S T S 201 GN(3), S T S 424(3)/BIOL 424(3)/PPATH 424(3), W F S 430(3)/FOR 430(3)
Students may substitute up to 3 credits of research topics, internship, or independent studies courses focused on a relevant environmental topic in consultation with an adviser (Sem: 1-8)

b.Justice and the Environment: Environment and Society
ANTH 456(3), E R M 411(3), ECON 428(3), GEOG 124 GS(3), GEOG 408W(3), GEOSC 402W GI(3), HIST 453(3), PHIL 131 GH(3), PHIL 132 GH(3), S T S 201 GN(3), SOC 420(3)/EM SC 420(3)/S T S 420(3), SOC 423(3)
Students may substitute up to 3 credits of research topics, internship, or independent studies courses focused on a relevant environmental topic in consultation with an adviser (Sem: 1-8)

c.Sustainable Development: Environmental Explorations
Students must take 3 credits each of social science, natural science, and arts and humanities courses:

Social Science	Natural Science	Arts and Humanities
ANTH 040(3), ANTH 146 GS;GI(3)	BIOL 220W GN(4), BIOL 427(3)	ENGL 400(3)*, ENGL 401*(3)
ANTH 152(3), ANTH 456(3)	BIOL 435(3), BIOL 446(3)	ENGL 404(3), ENGL 412(3)
ANTH 464(3)	BIOL 450W(5), BIOL 499A(3)	ENGL 413(3), ENGL 415(3)
ECON 428(3)	CHEM 102(3), CHEM 402(3)	ENGL 418(3), ENGL 430(3)
GEOG 406(3)	FOR 308(3)	HIST 200(3)*
PL SC 412(3), PL SC 420(3)	GEOG 115 GN(3)	HIST 428(3) or S T S 428(3)
S T S 327(3) or R SOC 327(3)	GEOSC 020 GN(3), GEOSC 303(3)	HIST 453(3)
S T S 430 GI(3) or NUTR 430 GI(3)	GEOSC 340(3)	PHIL 131 GH(3), PHIL 132 GH(3)
S T S 435(3)	W F S 408(3), W F S 430(3) or FOR 430(3)	PHIL 403(3)

*Where topic is appropriate, with program approval.

d.Environmental Literacy: Ideas About the Environment
ECON 428(3), ENGL 430(3), HIST 110 GH;GI(3), HIST 428(3), HIST 453(3), PHIL 403(3), S T S 100 GH(3), S T S 101 GH(3), SOC 420(3)/S T S 420(3)/EM SC 420(3)
Students may substitute up to 3 credits of research topics, internship, or independent studies courses focused on a relevant environmental topic in consultation with an adviser (Sem: 1-8)

e.Wet and Wild: Water Resources
A S M 327(3), BIOL 220W GN(4), BIOL 435(3), C E 361(3), C E 475(3), E R M 450(3)/W F S 450(3), ENT 425(3), FOR 470(3), GEOG 410(3), GEOSC 412(3), GEOSC 452(3), METEO 022(2), METEO 417(3), W F S 422(3)
Students may substitute up to 3 credits of research topics, internship, or independent studies courses focused on a relevant environmental topic in consultation with an adviser (Sem: 1-8)
Select 3 credits from E R M 430(3), GEOG 406(3), SOC 420(3)/S T S 420(3)/EM SC 420(3), SOC 423(3), SOILS 415(3), W F S 430(3)/FOR 430(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (3 credits)
Select one additional 3-credit course, environmentally related, preferably at the 400-level and outside the student's college and disciplinary group of student's major, to be approved by the adviser (Sem: 5-8)

NOTE: The ENVIRONMENTAL AND RENEWABLE RESOURCE ECONOMICS MINOR (Agricultural Sciences) was added after press deadline. See www.psu.edu/bulletins/bluebook.

ENVIRONMENTAL RESOURCE MANAGEMENT MINOR

College of Agricultural Sciences
The Environmental Resource Management (E R M) minor is designed to provide nonmajors with an overview of the principles and practices of managing resources prudently and economically.

The minor was developed to permit students of other majors to have their environmental interests and training formally documented on their academic records. Because so many of society's activities have an impact

on environmental quality, the minor should appeal to students with majors from a wide variety of disciplines, including journalism and education majors who want to write and teach in the environmental field.

The E R M minor includes an introduction to modern resource systems analysis and environmental impact assessment. Students may also elect to take courses in environmental law and resource allocation and economics. Individual programs are determined jointly by the student and the E R M Program Coordinator.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (10 credits)
E R M 151(1) (Sem: 1-2)
E R M 300(3), E R M 412(3), E R M 413W(3) (Sem:5-8)

ADDITIONAL COURSES (8 credits)
Select 8 credits from A S M 327(3), SOILS 101 GN(3), AG EC 201(3), or any E R M course (Sem: 3-8)

ENVIRONMENTAL SOIL SCIENCE MINOR

College of Agricultural Sciences

The Environmental Soil Science minor enables students to acquire scientific and field-related skills in preparation for environmental careers. Students learn to understand and apply soils and land use information in a wide variety of professional settings. The Environmental Soil Science minor will prepare students for jobs as professional soil scientists or for graduate studies in Soil Science and other interdisciplinary environmental sciences.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (3 credits)
SOILS 101 GN(3) (Sem: 1-5)

ADDITIONAL COURSES (15 credits)
Select 15 credits from SOILS courses in consultation with an Environmental Soil Science adviser, including at least 6 credits at the 400 level. (Sem: 2-8)

ENVIRONMENTAL STUDIES MINOR

Altoona College

The interdisciplinary interdisciplinary minor in Environmental Studies gives students a broad-based introduction to the natural environment and human interactions with it. Students gain awareness and understanding of environmental issues from the perspectives of several disciplines in relevant natural sciences (ecology, biology, geology, and/or environmental chemistry, for instance), the social sciences (environmental economics and/or public policy), and the arts and humanities (environmental history, ethics, and/or literature). Core courses in environmental studies, emphasizing applied and experiential learning, serve to integrate and synthesize knowledge from the natural sciences, social sciences, and arts and humanities. The goal of the program is "ecological literacy." Students completing the minor gain sufficient awareness and understanding of environmental issues to put environmental problems in a variety of contexts and to apply pertinent skills and knowledge (from studies in both their major and the minor) in addressing those problems. The minor helps prepare students for employment in the private sector or with government agencies and environmental advocacy groups, or for postgraduate study in environmental science, public policy, the humanities, or law.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES: (3 credits)
ENVST 100(3) (Sem: 1-2)

ADDITIONAL COURSES: (6 credits)
Select 3 credits from ENVST 200(3) or ENVST 400W(3) (Sem: 3-8)
Select 3 credits from BIOL 110 GN(4), BIOL 220W GN(4), ENGL 180 GH(3), GEOSC 020 GN(3), CHEM 102(3), CHEM 104(1), GEOG 115 GN(3), STAT 250 GQ(3), ECON 429(3), HIST 453(3), GEOG 407(3), PHIL 403(3) (Sem: 1-6)

SUPPORTING COURSES AND RELATED AREAS: (9 credits)
Select 9 credits (3 in each area listed below) in consultation with an academic adviser. At least six credits must be at the 400-level.

a. Natural Sciences: BIOL 240W(4), BIOL 417(3), BIOL 427(3), BIOL 435(3), BIOL 446(3) BIOL 450W(5), ENVST 497(3), FOR 308(3), FOR 430/WFS 430(3), GEOSC 303(3), GEOSC 340(3), GEOSC 462(3), MICRB 400(3), WFS 408(3) (Sem: 3-8).
b. Social Sciences: ANTH 040(3), ANTH 146 GS;GI(3), ANTH 152(3), ANTH 456(3), ANTH/BIO 464(3), ENVST 497(3), GEOG 401(3), GEOG 406(3), PL SC 420(3), PL SC 444(3), S T S 047(3) (Sem: 3-8)
c. Arts and Humanities: ENGL 404(3), ENGL 412(3), ENGL 415(3), ENGL 416(3), ENGL 421(3), ENGL 430(3), ENVST 497(3), HIST/S T S 151(3), HIST 428/S T S(3); When topic appropriate and with program approval: ENGL 400(3), ENGL 401(3), ENGL 483(3), HIST 200(3), HIST 497(3) (Sem: 3-8)
Other courses may be substituted with program approval.

EQUINE SCIENCE MINOR

College of Argricultural Sciences

The Equine Science is designed for students who wish to supplement their academic major with studies in equine science. Students are required to complete a minimum of 21 credits. The core prescribed courses develop a foundation in the basic disciplines of animal science and equine science. Additional courses may be selected by the student to allow further specialization and expertise in equine behavior, exercise physiology and training principles, selection and judging, equine facilitated therapy, business/farm management, animal genetics and breeding, nutrition, and physiology. With completion of this minor, students will have a foundation of theoretical and practical knowledge along with learning skills for adapting to changes in equine industry. Courses that make up the minor are appropriate for students with and without prior academic or practical experience with horses. The University Horse Farms and the Agricultural Arena are used extensively for supplementing classroom work with hands-on laboratories. Completion of this minor will enhance a student's ability to work directly in horse production and management and allied industries, or continue academic studies in graduate or professional school.

A grade of C or better must be obtained in each course in order to complete the minor.

REQUIREMENTS FOR THE MINOR: 21 credits
(a minimum of 9 credits must be taken at the 400 level)

PRESCRIBED COURSES (15 credits)
AN SC 001(4), AN SC 037(2) (Sem: 1-4)
AN SC 327(3), AN SC 417(2) (Sem: 5-8)
AN SC 400(1), AN SC 407(3) (Sem: 7-8)

ADDITIONAL COURSES (6 credits)
Select 3 credits from: AN SC 300 GN(3), AN SC 301(3), AN SC 317(3), AN SC 322(3), B A 250(3), KINES 150(3), KINES 202(4), or V SC 303(3) (Sem: 5-8)
Select 3 credits from: AGRO 423(3), AN SC 420(4), AN SC 423(3), AN SC 426(2), AN SC 431W(4), AN SC 437(3), AN SC 442(3), or AN SC 447(3) (Sem: 5-8)

EXTENSION EDUCATION MINOR

College of Agricultural Sciences

The Extension Education minor is an interdisciplinary program of study designed to prepare students for work in the Penn State Cooperative Extension or other nonformal education programs.

The minor offers course work from several disciplines and addresses student needs in areas such as nonformal education methods, adult education, leadership, youth programs, and communication methods and media. A period of internship or field experience is required. To complete a bachelor's degree with a minor in Extension Education, a student is required to complete 18 credits from a list of recommended courses. The core program consists of 15 credits. Students are expected to strengthen their expertise by taking at least 3 additional credits from the courses recommended.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (15 credits)
EXTED 450(3), EXTED 455(3), EXTED 495(6), R SOC 305W(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (3 credits)
ADTED 460(3), EXTED 295(1-2), EXTED 440(3), EXTED 496(1-3), or EXTED 497(1-9) (Course selection may be influenced by experience and educational background of the student. Individual programs are set jointly by the student and the program committee chair.) (Sem: 1-8)

NOTE: The FILM STUDIES MINOR (Communications and Liberal Arts) was added after press deadline. See www.psu.edu/bulletins/bluebook.

FINANCE MINOR

Penn State Erie, The Behrend College
A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES: (6 credits)
FNC 300(3) and FNC 410(3) (Sem: 5-6)

SUPPORTING COURSES AND RELATED AREAS: (12 credits)
Select 12 credits in consultation with an adviser from ACNTG 426 or 300- or 400-level FNC courses. (At least 6 credits must be at the 400 level.) (Sem: 7-8)

FOREST SCIENCE MINOR

College of Agricultural Sciences
The Forest Science minor is offered for students who wish to achieve a basic competency in forestry without qualifying as professional foresters. This minor is particularly compatible with the Wildlife and Fisheries Science and Wood Products majors.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18-19 credits

PRESCRIBED COURSES: (13 credits)
FOR 203(2), FOR 308(3), FOR 366(4), FOR 421(3), and W P 203(1) (Sem: 3-4)

ADDITIONAL COURSES: (5-6 credits)
Select 2-3 credits from FOR 339(3) or FOR 320(2) (Sem: 3-4)
Select 3 credits from FOR 416(3), FOR 440(3), FOR 455(3), FOR 470(3), FOR 475(3) or FOR 480(3) (Sem: 5-8)
Other FOR courses may be used in lieu of these additional courses by petitioning the Forest Science faculty —at least 3 credits must be taken at the 400-level

FRENCH MINOR

College of the Liberal Arts
The French minor is designed to give students the opportunity to improve their knowledge of French language and culture (literature, civilization, film). Courses taken for the minor may also be counted for Basic Degree and major requirements.

A grade of C or better is required for all courses in the minor.
REQUIREMENTS FOR THE MINOR: 19 credits

PRESCRIBED COURSES: (7 credits)
FR 201(4), FR 202(3) (Sem:1-6)

ADDITIONAL COURSES: (6 credits)
Select 3 credits from FR 351(3) or FR 352(3) (Sem: 1-6)
Select 3 credits from FR 308(3), FR 310(3), or FR 330(3) (Sem: 1-6)

SUPPORTING COURSES AND RELATED AREAS: (6 credits)
Select 6 credits of 400-level French courses (Sem: 5-8)

GEOGRAPHIC INFORMATION SCIENCE MINOR

College of Earth and Mineral Sciences
A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (3 credits)
GEOG 121 GS(3) (Sem: 3-6)

ADDITIONAL COURSES (15 credits)
Select 6 credits from GEOG 321(3), GEOG 352(3), or GEOG 357(3) (Sem: 3-6)
Select 9 credits (at least 6 credits at the 400-level) from GEOG 330(3), GEOG 356(3), GEOG 421W(3), GEOG 422(3), GEOG 425(3), GEOG 437(3), GEOG 458(3), GEOG 459(3), GEOG 480(3), or GEOG 481(3) (Sem: 5-8)

GEOGRAPHY MINOR

College of Earth and Mineral Sciences

The Geography minor can complement most majors in the social sciences, physical sciences, biological sciences, and technical disciplines. The geography minor is flexible so that students can tailor their course choices to accommodate individual interests. A broadly based approach to selecting minor courses can be appropriate for students whose majors are highly specialized or narrowly focused. Alternatively, students may choose to fulfill geography minor requirements with a particular content emphasis, such as an interest in environmental issues or urban and regional planning. Looking through course choices and talking with geography staff can make earning the geography minor an important enhancement to one's academic program.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

SUPPORTING COURSES AND RELATED AREAS (18 credits)
In consultation with a geography adviser:
Select 3 credits in physical geography (Sem: 3-6)
Select 3 credits in human geography (Sem: 3-6)
Select 6 credits of additional geography courses (Sem: 3-6)
Select 6 credits of 400-level geography courses (Sem: 5-8)

GEOSCIENCES MINOR

College of Earth and Mineral Sciences

The Geosciences minor provides a foundation in the physical and material aspects of the solid Earth, as well as an introduction to field techniques and technical writing. Advanced course work should reflect the students' individual interests. Areas of focus include, but are not limited to: earth materials, evolution of the Earth and life, hydrogeology, environmental geology, natural hazards, plate tectonics, geophysics, climate change. The minor consists of 18 credits of course work, some of which are filled through specific courses as indicated below.

A grade of C or better is required in each course in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (7 credits)
GEOSC 021 GN(3) (Sem: 1-6)
GEOSC 201(4) (Sem: 3-8)

ADDITIONAL COURSES (6 credits)
Select 3 credits from GEOSC 001(3), GEOSC 020 GN(3), or GEOSC 071(3) (Sem: 1-6)
Select 3 credits from GEOSC 470W(3), EM SC 470W(3-6) (Sem: 5-8)
SUPPORTING COURSES AND RELATED AREAS (5 credits)
Select 5 credits from a number of courses covering a variety of disciplines and fields of interest. Consult with your adviser. At least 3 credits in this category must be taken at the 400 level; the remaining 2 credits may be at the 200 level or above. (Sem: 5-8)

GERMAN MINOR

College of the Liberal Arts

The German minor is designed for students who want to study the language, literature, and culture of German-speaking countries in order to broaden their horizons and meet an increasing demand for people with foreign language skills and international expertise. German is one of the most important languages in Western Europe, being the mother tongue of approximately 100 million Europeans, and in the countries of Eastern Europe it is the most important foreign language of business and commerce.

The Department of Germanic and Slavic Languages and Literatures offers a wide array of courses in German language, literature and culture as well as in professional and business German, allowing students great independence in shaping their own academic program. Students are encouraged to take advantage of Penn State's study abroad opportunities, which include the possibility of a semester in Kiel or a full year in Marburg. For the German minor, students must take a minimum of 18 credits beyond GER 003, including GER 201, GER 301, GER 302W, GER 310, and at least two 400-level courses. All courses must be taught in German and the students must receive a grade of C or better.

The German minor opens employment opportunities for its graduates in fields and professions where proficiency in one or more foreign languages is desirable or required, i.e., secondary and higher education, government, business, the media, and public relations.

REQUIREMENTS FOR THE MINOR: 19 credits

PRESCRIBED COURSES: (13 credits)
GER 201(4), GER 301(3), GER 302W(3) and GER 310(3) (Sem: 3-6)

SUPPORTING COURSES AND RELATED AREAS: (6 credits)
Select 6 credits of 400-level GER courses (Sem: 5-8)

GERONTOLOGY MINOR

Intercollege

The intercollege minor in Gerontology is designed for students to gain an in-depth understanding of the aging process and old age. With the growth of the number of older people in the population, increased need has arisen for people with knowledge of the aging process in a variety of professional and occupational roles. In conjunction with the student's major, the minor prepares students for entry-level human service positions working with the elderly, or for graduate or professional school programs including communication disorders, counseling, health planning and administration, medicine, psychology, recreation and park management, and social work where knowledge of the aging process and problems of older people is relevant. Eighteen credits are required for the minor, including at least 6 credits at the 400 level. Advising is available through Pamela D. Evock, 211 South Henderson, University Park, PA 16802 (814-863-8000, pde1@psu.edu). A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (3 credits)
HD FS 249 GS(3) (Sem: 3-8)

ADDITIONAL COURSES (15 credits)
BIOL 055 GN(3) or BIOL 409(3) (Sem: 1-7)
SOC 435 (HD FS 434)(3) or HD FS 445 (PSY 445)(3) (Sem: 5-8)
Select 9 credits, at least 6 at the 400 level, from ADTED 460(3), ANTH 473(3), BB H 302 GI(3), BB H 316(3), BB H 410(3), BB H 440(3), CN ED 415(3), H P A 101(3), H P A 440(3), H P A 442(3), HD FS 413(3), HD FS 445 (PSY 445)(3), HD FS 446(3), HD FS 447(3), KINES 481W(3), NURS 464(3), NUTR 451(3), NUTR 456(2), R P M 462(3), R SOC 422(3), R SOC 497(3), SOC 023 GS(3), SOC 174(3), SOC 423(3), SOC 435(3) (Sem: 3-8)
NOTE: Students may enroll in special topics courses (297, 497) that focus on aging or old age, with faculty permission. With faculty approval, students may also enroll for independent studies in their major department to write a senior thesis focused on an issue of aging.

GLOBAL BUSINESS STRATEGIES FOR THE EARTH, ENERGY, AND MATERIAL INDUSTRIES MINOR

Smeal College of Business; College of Earth and Mineral Sciences

The minor in Global Business Strategies for the Earth, Energy, and Materials Industries is a joint offering of the College of Earth and Mineral Sciences and the Smeal College of Business Administration. The minor introduces students to financial, investment, and management concepts applied to private sector organizations whose operation emphasizes the Earth and its environment, the energy and mineral industries, or the development of new and enhanced materials. The minor focuses on the leadership and information strategies characteristic of enterprises that are succeeding in a rapidly integrating global economy.

The minor provides science and engineering students an introduction to basic entrepreneurial and business concepts to help prepare them for success in a changing professional environment. It provides students in the Smeal College an opportunity to focus on business strategies in the Earth resources, environmental, and materials industries. A minimum of 18 credits is required for the minor. ECON 002 is a prerequisite for several of the courses in the minor. A student enrolled in this minor must receive a grade C or better, as specified in Senate Policy 82-44. Advising is available through the EMS Student Center (25 Deike Building).

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (6 credits)
ECEEM 100 GS(3) (Sem: 3-4)
EM SC 401 GN(3) (Sem: 5-8)

ADDITIONAL COURSES (6 credits)
B A 301(2) or FIN 100(3) or EM SC 301(3) (Sem: 3-8)
B A 304(2) or MGMT 100(3) or EM SC 304(3) (Sem: 3-8)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 3-6 credits (at least 3 credits at the 400 level) from the approved list of EMS courses and/or 3-6 credits of 400-level project-based independent study approved by the Professor in Charge (Sem: 5-8).

GREEK MINOR

College of the Liberal Arts
The Greek minor focuses on establishing proficiency in reading and interpreting classical Greek literature. After completing an introductory course sequence (elementary classical Greek) that teaches students the vocabulary, morphology and syntax of classical Greek, students complete at least six credits in Greek language and literature at the 400-level for a total of 18 credits for the minor. In advanced courses in Greek language and literature, students gain analytical and interpretive skills by reading a wide range of classical Greek literature, including Greek drama, history, and philosophy, as well as the Greek New Testament. Students minoring in Greek will find their studies mesh well with a number of majors and graduate fields, including anthropology, archaeology, history, English, comparative literature, philosophy, and law.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

SUPPORTING COURSES AND RELATED AREAS: (18 credits)
Select 12 credits of GREEK courses (Sem: 1-8)
Select 6 credits of 400-level GREEK courses (Sem: 5-8)

NOTE: The HEALTH POLICY MINOR (Altoona) was added after press deadline. See www.psu.edu/bulletins/bluebook.

HEALTH POLICY AND ADMINISTRATION MINOR

College of Health and Human Development
The minor in Health Policy and Administration (H PA) is designed to allow students to learn more about the health care system, health policy, and health administration. The minor is most appropriate for students interested in clinical and health-related fields (e.g., nursing, nutrition, biobehavioral health, or medicine), professional fields (e.g. business administration or law), or the social sciences (e.g., economics, sociology, political science, psychology), giving these students an understanding of the health care industry and the impact of business and government on that industry. Students must take 6 credits of prescribed courses including H P A 101(3), which introduces the organization of the health care system, and H P A 057 GHA(3), which considers the role of the health care consumer in the health care system. Students then focus their study on either health policy or health administration, choosing among courses at the 300 and 400 level. Students select 3-6 credits from H P A 301(3), H P A 310(3), and H P A 332(3) and 6-9 credits from 400-level H P A courses.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (6 credits)
H P A 057 GHA(3) and H P A 101(3) (Sem: 3-6)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 3-6 credits from H P A 301W(3), H P A 310(3), H P A 332(3) (Sem: 3-6)
Select 6-9 credits from 400-level H P A courses (Sem: 5-8)
NOTE: Some courses have additional prerequisites that must be met.

HEBREW MINOR

College of the Liberal Arts
The minor in Hebrew is intended to provide students with a good working knowledge of the Hebrew language, taught in a context that emphasizes the characteristics of Jewish tradition and Israeli culture and society. Students undertake three years of language study (or equivalent); education abroad can be included.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 21 credits

PRESCRIBED COURSES (12 credits)
HEBR 001(4), HEBR 002(4), HEBR 003(4) (Sem:1-4)

ADDITIONAL COURSES (9 credits)
Select 3 credits from HEBR 110(3), HEBR 111(3), HEBR 199 GI(1-12) HEBR 296(1-18), HEBR 297(1-9), HEBR 399 GI (1-12) (Sem: 1-8)

Select 6 credits from HEBR 401(3-6), HEBR 402(3-6), HEBR 496(1-18), HEBR 497(1-9), HEBR 499 GI(1-12) (Sem: 5-8)

HISTORY MINOR

Abington College; Altoona College; College of the Liberal Arts
Theminor in history is designed to complement a wide range of social studies and humanities majors by affording students the opportunity to examine change and development in human societies over time. Students are free to select courses in the topics (military history, social history, cultural history, etc.), geographical areas (the United States, Latin America, Europe, Asia, and Africa), and time periods that most suit their needs and interests. The requirements for entering the minor are fifth semester standing (eligible courses taken previously will count toward the minor) and having already declared a major.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

SUPPORTING COURSES AND RELATED AREAS: (18 credits)
Select 12 credits of HIST courses (Sem: 1-8)
Select 6 credits of 400-level HIST courses (Sem: 5-8)

HISTORY MINOR

Penn State Erie, The Behrend College
A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

SUPPORTING COURSES AND RELATED AREAS (18 credits)
Select 12 credits of HIST or HSTRY courses (Sem: 1-8)
Select 6 credits of 400-level HIST or HSTRY courses (Sem: 5-8)

HORTICULTURE MINOR

College of Agricultural Sciences
A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18-19 credits

PRESCRIBED COURSES (9 credits)
HORT 101(3), HORT 202(3), and HORT 315(3) (Sem: 1-6)

ADDITIONAL COURSES (9-10 credits)
Select 3 credits in systematics from HORT 131(3), HORT 137(3), HORT 138(3), or HORT 232(3) (Sem: 3-4)
Select 6-7 credits in foundation and production courses from HORT 402W(3), HORT 407(3), HORT 412W(3), HORT 420(3), HORT 430W(3), HORT 431(3), HORT 432(3), HORT 433(3), HORT 444(4), HORT 450(3), HORT 453(3), HORT 455(3), or HORT 469(3) (Sem: 7-8)

HUMAN DEVELOPMENT AND FAMILY STUDIES MINOR

Altoona College; College of Health and Human Development
A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (3 credits)
HD FS 129 GS(3) (Sem: 1-4)

SUPPORTING COURSES AND RELATED AREAS (15 credits)
Select 9 credits of HD FS courses (Sem: 1-6)
Select 6 credits of 400-level HD FS courses (Sem: 5-8)

INDUSTRIAL HEALTH AND SAFETY MINOR

College of Earth and Mineral Sciences
The minor in Industrial Health and Safety offers a specialized program for students in many other broad-based majors, such as in engineering or science, who wish to pursue a career in the areas of occupational safety and health or public health. It offers an array of courses, which provide insight into these and other similar

professions. It is recommended that students complete MATH 140 GQ(4), MATH 141 GQ(4), and CHEM 012 GN(3) if they wish to pursue this minor.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (9 credits)
I H S 400(3), I H S 430(3), and I H S 445(3) (Sem: 5-6)

ADDITIONAL COURSES (9 credits)
Select 9 credits from I H S 410(3), I H S 420(3), I H S 447(4), I H S 440(3), I H S 450(3), or I H S 470(3) (Sem: 7-8)

INFORMATION SCIENCES AND TECHNOLOGY MINOR

School of Information Sciences and Technology

This minor is structured to provide students with the theoretical frameworks and skill sets necessary to compete and be productive in the information technology-intensive global context that defines the new "Information Age." Specifically, the minor will be focused on a program that will build an understanding of core information technologies and related areas of study; will prepare students for the practical application of various information sciences and related technologies; and engage students in sharpening their abilities to think critically and to work in teams. All this will be done with the intent to expose students to the cognitive, social, institutional, and global environments of Information Sciences and Technology and to then apply that knowledge as a supplement to their major.

A one-time tuition surcharge will be applied to all students enrolled in the minor. A grade of C or better is required for all courses in this minor.

REQUIREMENTS FOR THE MINOR: 19 credits

PRESCRIBED COURSES (10 credits)
IST 110(4), IST 210(3), IST 220(3) (Sem 1-6)

ADDITIONAL COURSES (9 credits)
Select 3 credits from IST 250(3), IST 301(3), or IST 302(3) (Sem 5-8)
Select 6 credits from IST 402(3), IST 431(3), or IST 432(3) (Sem 5-8)

INFORMATION SCIENCES AND TECHNOLOGY FOR ACCOUNTING MINOR

Capital College

Accounting remains a vital organizational function which, in today's business environment, impacts the strategic direction of the firm. Technology has changed the manner in which business organizations are supported by accounting. Thus, accounting professionals with technology skills and technology professionals with accounting skills are extremely valuable in today's modern organization. This new minor will provide students with this integration of knowledge in these two fields.

Students must apply for entrance to the minor no later than the beginning of their sixth semester. A one-time tuition surcharge of $750 will be applied when students formally enroll in the Information Sciences and Technology for Accounting Minor.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 22 credits

PRESCRIBED COURSES (19 credits)
IST 110(4), IST 210(3), IST 220(3) (Sem. 1-8)
ACCT 301(3), ACCT 400(3), ACCT 435(3) (Sem. 5-8)

ADDITIONAL COURSES (3 credits)
Select 3 credits from ACCT 340(3), ACCT 401(3), ACCT 430(3) (Sem. 6-8)

INFORMATION SCIENCES AND TECHNOLOGY FOR EARTH AND MINERAL SCIENCES MINOR

College of Earth and Mineral Sciences; School of Information Sciences and Technology

Information Systems are a core component of any research, educational or industrial enterprise in the Earth and Materials Sciences. In addition, the science and engineering disciplines represented in the College have a particular focus on numerical modeling and simulation systems, and on the analysis and management of very

large data sets. The EMS - IST minor provides students a basic introduction to information sciences and information technology through courses in the core curriculum of the School of Information Sciences and Technology. Students then select from a group of interdisciplinary EMS courses that focus on the particular interests of the College.

Students must apply for entrance to the minor no later than the beginning of their seventh semester. A one-time tuition surcharge will be applied to all students enrolled in the minor. A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 19 credits

PRESCRIBED COURSES (13 credits)
IST 110(4) (Sem: 1-2)
IST 210(3) (Sem: 3-4)
IST 220(3), GEOG 480(3) (Sem: 5-6)

ADDITIONAL COURSES (6 credits)
Select 6 credits from P N G 430(3), EM SC 468(3), ECEEM 425(3), or METEO 473(3) (Sem:5-8)

INFORMATION SCIENCES AND TECHNOLOGY FOR HEALTH POLICY AND ADMINISTRATION MINOR

College of Health and Human Development; School of Information Sciences and Technology

The learning objectives of the minor in Information Sciences and Technology in Health Policy and Administration (IST/HPA) are to equip students with the skills and knowledge to meet the critical need for persons with expertise in health care information technology. Specialists in this field assist health care organizations develop and apply the information technologies needed to develop Web-based systems for patient education, physician-patient interaction and physician-physician consultation, securely transmit sensitive medical information electronically, and even pioneer efforts for advanced technologies like remote robotic surgery. The IST/HPA minor provides students with a solid base in the information sciences and technology through courses in IST's core curriculum. This core is then supported by selections from a group of HPA courses studying the application of information technology in health planning, financing, or marketing. Students must apply for entrance to the minor no later than the beginning of their seventh semesters. A one-time tuition surcharge will be applied to all students enrolled in the minor.

A grade of C or better is required for all courses in this minor.

REQUIREMENT FOR THE MINOR: 19 credits

PRESCRIBED COURSES (13 credits)
IST 110(4) (Sem: 1-2)
IST 210(3) (Sem: 3-4)
IST 220(3) (Sem: 5-6)
H P A 470(3) (Sem: 7-8)

ADDITIONAL COURSES (6 credits)
Select 6 credits from H P A 431(3), H P A/BB H 440(3), H P A 447(3), or H P A 455(3) (Sem: 5-8)
NOTE: The H P A courses have additional prerequisites that must be met.

INFORMATION SCIENCES AND TECHNOLOGY FOR HOTEL, RESTAURANT, AND INSTITUTIONAL MANAGEMENT MINOR

College of Health and Human Development; School of Information Sciences and Technology

The Internet and associated technologies have become vital communication channels for hospitality professionals. Historically, hospitality facilities such as hotels and restaurants used telephone, printed ads, and face-to-face contact to interact with customers. Now, technology is allowing Web sites, kiosks, e-mail, cell phones, personal digital assistants, and interactive television. Within the hospitality industry, corporate communications and training for employees can be handled electronically. Clearly, it is critical for HR&IM students to be cognizant about information science and technology if they are to succeed in hospitality management. Specifically, the learning outcomes for the IST-HR&IM minor are that students will attain the knowledge base necessary to direct the planning, design, and analysis of information technology systems for hospitality corporations and to integrate these systems for strategic, tactic, and operational use.

A one-time tuition surcharge will be applied to all students enrolled in the minor. A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 19 credits

PRESCRIBED COURSES (19 credits)
IST 110(4) (Sem: 1-2)
IST 210(3) (Sem: 3-4)
IST 220(3), HRIM 350(3) (Sem: 5-6)
HRIM 470(3), HRIM 471(3) (Sem: 7-8)

INFORMATION SCIENCES AND TECHNOLOGY FOR MATHEMATICS MINOR

Eberly College of Science; School of Information Sciences and Technology

The interaction between Information Sciences and Mathematics will continue developing in remarkable new directions. Mathematical scientists enormously benefit from information technology in the performance of research, in communicating and disseminating scientific information and results, as well as in career environments involving data analysis and management. Mathematicians also contribute to making inroads towards the development of new information technologies. Information sciences and technology are already playing a very important role in mathematical education, at all levels, and will experience an overwhelming increase in the near future. Giving undergraduate mathematics students the opportunity to minor in IST will not only enrich their educational achievements but it will also help them succeed in the employment searches.

Students must apply for entrance to the minor no later than the beginning of their senior year. A one-time tuition surcharge will be applied to all students enrolled in the minor. A grade of C or better is required in all courses in the minor.

REQUIREMENTS FOR THE MINOR: 19 credits

PRESCRIBED COURSES (10 credits)
IST 110(4) (Sem: 1-2)
IST 210(3) Sem: 3-4)
IST 220(3) (Sem: 5-6)

ADDITIONAL COURSES (9 credits)
Select 9 credits from the following 400-level mathematics courses: MATH 451(3), MATH 457(3), MATH 459(3), MATH 465(3), MATH 467(3), MATH 468(3), MATH 469(3) (Sem: 5-8)

INFORMATION SCIENCES AND TECHNOLOGY FOR SPEECH COMMUNICATION MINOR

College of the Liberal Arts; School of Information Sciences and Technology

The internet and other technologies are emerging as important communication channels. People establish personal relations online, develop language skills, conduct business, and make arguments online. Web sites have become important sites of public discourse and are playing an encompassing role in political campaigns. Students who pursue careers as communication consultants, in management or human resources, as political speech writers, and as independent business operators need information management skills. As a result, it is essential for Communication Arts and Sciences students to be versed fully in information sciences and technology for both personal and professional advancement. A one-time tuition surcharge will be applied to all students enrolled in the minor. A grade of C or better is required for all courses in this minor.

REQUIREMENTS FOR THE MINOR: 19 credits

PRESCRIBED COURSES (10 credits)
IST 110(4) (Sem: 1-2)
IST 210(3) (Sem: 3-4)
IST 220(3) (Sem: 5-6)

ADDITIONAL COURSES (9 credits)
Select 9 credits of CAS courses from a department-approved list with at least 6 credits at the 400 level. (Sem: 5-8)

INFORMATION SCIENCES AND TECHNOLOGY FOR TELECOMMUNICATIONS MINOR

College of Communications; School of Information Sciences and Technology

This minor offers students an opportunity to examine the opportunities and challenges presented by convergence of telecommunications and information processing. Internet-mediated services have the potential of fundamentally changing how we communicate and engage in commerce. This convergence offers faster, better, cheaper, smarter, and more convenient services, but also raises a variety of legal, regulatory, political, social, economic, and technology management issues. The IST/Telecommunications minor offers students enrolled in majors outside the College of Communications and the School of Information Sciences and Technology an

opportunity to examine how telecommunications and information processing technologies and services will impact society as well as their individual circumstances.

The Telecommunications requirements of this minor constitute three courses (nine credit hours). Students can fulfill this requirement by completing COMM 180 offered by the Telecommunications Department in the College of Communications and by completing two additional courses from the following list: COMM 484(3), COMM 490(3), COMM 491(3) and COMM 492(3). Three IST courses (ten credit hours) constitute the other part of this minor.

A one-time tuition surcharge will be applied to all students enrolled in the minor. A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 19 credits

PRESCRIBED COURSES (13 credits)
IST 110(4) (Sem: 1-2)
IST 210(3) (Sem: 3-4)
IST 220(3), COMM 180(3) (Sem: 5-6)

ADDITIONAL COURSES (6 credits)
Select 6 credits from the following: COMM 484(3), COMM 490(3), COMM 491(3) and COMM 492(3) (Sem: 7-8)

INFORMATION SYSTEMS AND STATISTICAL ANALYSIS MINOR

College of the Liberal Arts

This minor minor focuses on the use of information systems and statistical methods for solution of human problems. This minor is applicable to any major throughout the University and enhances the student's preparedness for graduate, research, and career opportunities. A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 19 credits

PRESCRIBED COURSES (10 credits)
CAS 283(3), STAT 200 GQ(4) (Sem: 3-4)
CAS 483(3) (Sem: 5-8)
SUPPORTING COURSES AND RELATED AREAS (9 credits)
Students must select 9 credits in consultation with the adviser from courses focusing on information systems or computer science with at least 3 credits at the 400 level. No more than 6 credits may be selected in computer science. (Contact person in charge of the minor for list of appropriate courses.) (Sem: 1-8)

INSURANCE MINOR

Smeal College of Business

The Insurance minor prepares students for careers in risk management and insurance as well as familiarizes those students in related areas with the important aspects of risk management in the business environment. Students with a minor in insurance study the management of insurable risks within the firm, the legal, regulatory and financial aspects of insurance, as well as personal financial and estate planning. They take courses in the principles of risk, and insurance, property-liability insurance, corporate risk management, life insurance, estate planning and real estate. When coupled with a related major, students are prepared for careers in insurance underwriting, risk management, claims management, sales or personal financial planning.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (15 credits)
INS 301(3), INS 320(3), INS 400(3), INS 405(3), R EST 301(3) (Sem: 5-8)

ADDITIONAL COURSES (3 credits)
Select 3 credits from INS 305(3) or INS 310W(3) (Sem: 5-8)

INTERNATIONAL AGRICULTURE MINOR

College of Agricultural Sciences

This minor is an interdisciplinary program of study designed to enable students to (1) gain an awareness and appreciation for the interrelationship and interdependency of the nations of the world for their food and fiber; (2) gain an awareness of the resources available to solve problems in international agriculture; and (3) recognize systems of learning transfer and understand the impact of technological transfer across cultures.

This minor may be combined with any undergraduate major in the University. It requires 18 credits in

addition to the baccalaureate degree and departmental major requirements of the student's choice. Some courses require prerequisites not included in the minor. Foreign language competence is highly recommended. A grade of C or better is required for all courses in the minor.

Students may apply for admission to the minor by completing and submitting an application for admission to a minor to 323 Agriculture Administration Building, University Park Campus. Approval from the student's major program adviser also is required. For more information, contact Dr. Thomas H. Bruening, 323 Agriculture Administration Building, (814) 863-7069.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (6 credits)
INTAG 100 GS;GI(3), INTAG 481(3) (Sem: 3-4,7-8)

ADDITIONAL COURSES (12 credits)
Select 6-9 credits from AG EC 450 GI(3), SOILS 101 GN(3), S T S 497(3), or Animal Agriculture (3) (Sem: 5-8)
Select 3-6 credits from INTAG 296(1-3), INTAG 297(1-3), INTAG 495(1-6), INTAG 496(1-3), INTAG 497(1-3) (In consultation with their international agriculture adviser, students may select 3-6 credits that focus substantially on international development, international understanding, culture, and civilization.) (Sem: 1-8)

INTERNATIONAL BUSINESS MINOR

Capital College

This minor provides undergraduate students in all business administration majors with further studies in such areas as international accounting, finance, information systems, comparative management, international marketing, or economics. The objective of the minor is to provide students who are interested in careers in international business with an understanding of problems and problem-solving methods that transcend national boundaries. Proficiency in a foreign language and study abroad provide an understanding of the social, political, and cultural context of the global marketplace. Except for Professional Accountancy, the minor can be included in the major with no additional courses being required. Professional Accountancy students may have to take 12 additional credits. Students must receive a grade of C or better in all courses required for the minor.

REQUIREMENTS FOR THE MINOR: 21 credits
(A minimum of 3 credits in the minor must be taken in an approved study abroad program.)
PRESCRIBED COURSES (3 credits)
BUS 364W GI(3) (Sem. 7-8)

SUPPORTING COURSES AND RELATED AREAS (18 credits)
Select 9 credits in a single foreign language (Sem. 1-6)
Select 9 credits from BUS 485(3), ECNMS 418(3), FINAN 426(3), INFSY 446(3), MNGMT 461(3), MRKT 477(3), ACCT 470 DF(3) (Sem. 5-8)

INTERNATIONAL BUSINESS MINOR

Smeal College of Business

The International Business minor provides students with knowledge, skills, and experiences that prepare them for a business career that might include international responsibilities. Mastery of fundamental business concepts, course work in international business or economics, foreign language skills, and an approved study abroad experience each contribute to build perspectives about the challenges and opportunities of commercial activity in a global business environment.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 30 credits

PRESCRIBED COURSES (12 credits)
ACCTG 211(4) (Sem: 1-4)
B A 301(2), B A 302(2), B A 303(2), B A 304(2) (Sem: 5-6)

ADDITIONAL COURSES (6 credits)
Select 6 credits from the following with at least 3 credits at the 400 level: I B 303(3), ECON 333(3), I B 403(3) or I B 404(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 3 credits of foreign language. (Sem: 1-4)
Select 6 credits from an education abroad program with prior approval by the Smeal College International Programs Office. (Sem: 4-7)
Select 3 credits of 400-level International Business related course work. See Program List. (Sem: 6-8)

INTERNATIONAL STUDIES MINOR

Abington College; Commonwealth College; Penn State Erie, The Behrend College; College of the Liberal Arts

The International Studies minor is intended to recognize, for undergraduate students in any major, the completion of an education abroad program, foreign language competency, and related advanced course work. Ideally, the language, international, and advanced study should be integrated around some thematic or geographical focus. A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18-30 credits

SUPPORTING COURSES AND RELATED AREAS (18-30 credits)
12th-credit-level proficiency in one foreign language demonstrated by course work or examination (Sem: 1-4)
Students must complete 12 credits as participants in an approved Penn State study abroad program, no more than 6 credits of which may be foreign language study beyond the 12-credit level (Sem: 5-6)
Select 6 credits (400 level) related to the education abroad experience, or the student's major, or to complete a thematic concentration. Courses must be selected from the approved list of courses with international focus or in consultation with the International Studies Minor adviser (Sem: 5-8)

ITALIAN MINOR

College of the Liberal Arts

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

SUPPORTING COURSES AND RELATED AREAS (18 credits)
Select 12 credits of Italian courses (Sem: 3-6)
Select 6 credits of 400-level Italian courses (Sem: 5-8)
NOTE: Courses given in English such as Civilization or Literature in Translation may not be credited toward the minor.

JAPANESE LANGUAGE MINOR

College of the Liberal Arts

The minor in Japanese is intended to provide students with a good working knowledge of the Japanese language, taught in a context that emphasizes the characteristics of Japanese culture and society. Students undertake three years of language study (or equivalent); education abroad can be included.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 21 credits

PRESCRIBED COURSES (12 credits)
JAPNS 001(4), JAPNS 002(4), JAPNS 003(4) (Sem: 1-4)

ADDITIONAL COURSES (9 credits)
Select 3 credits from JAPNS 110(3), JAPNS 296(1-18), JAPNS 297(1-9), or JAPNS 299 GI(1-12) (Sem: 1-8)
Select 6 credits from JAPNS 401(3), JAPNS 402(3), JAPNS 496(1-18), JAPNS 497(1-9), or JAPNS 499 GI(1-15) (Sem: 5-8)

JEWISH STUDIES MINOR

College of the Liberal Arts

This is an interdisciplinary minor for students interested in the study of Jewish history, thought, and culture. Time periods and geographical areas covered range from ancient Israel and its environs to much of the modern world. Specializations include, but are not limited to, archaeology and history, Biblical studies, history of religions and intellectural history, anti-Semitism, Zionism and modern Israel, and Hebrew language and modern literature.

For the Jewish Studies minor, a minimum of 22 credits is required, with at least 6 credits at the 400 level. Students must achieve intermediate-level proficiency in Hebrew language. Up to 15 credits of study abroad may be substituted for supporting course requirements. All required course work must be completed with a grade of C or higher.

REQUIREMENTS FOR THE MINOR: 22 credits

PRESCRIBED COURSES (7 credits)
HEBR 003(4), J ST/HEBR 010 GH;GI(3) (Sem: 1-6)

ADDITIONAL COURSES (15 credits)
(At least 6 credits must be at the 400 level)
Students must select courses in consultation with their adviser from an approved list (Sem: 5-8)

LABOR AND INDUSTRIAL RELATIONS MINOR

College of the Liberal Arts
This interdisciplinary minor is designed for students in any major of the University who wish to supplement their knowledge in the areas of labor studies and industrial relations. The minor consists of 18 credits, at least 6 of which must be at the 400 level. A certificate is awarded to students who complete the requirements of the minor. A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits
(at least 6 credits at the 400 level)

PRESCRIBED COURSES (3 credits)
L I R 100 GS(3) (Sem: 1-6)

ADDITIONAL COURSES (3 credits)
L I R 101 GS(3) or L I R 433(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 3-6 credits in Labor and Industrial Relations (Sem: 5-8)
Students may select, in consultation with their Labor Studies and Industrial Relations adviser, 6-9 credits from courses in business administration, economics, management, political science, psychology, and sociology (Sem: 1-8)

LATIN MINOR

College of the Liberal Arts
The Latin minor emphasizes the development of skills in the linguistic and literary aspects of the Latin language. Through 18 credits of course work, including 6 at the 400-level, students develop mastery of the grammatical structures essential to the ability to read Latin; a vocabulary adequate to the sight recognition of a large number of Latin vocabulary items; and a thorough understanding of the formal system of word inflection and derivation which forms the grammatical core of the language. Once students have completed the basic 12 credits in LATIN 001, LATIN 002 and LATIN 003, they have the opportunity to pursue their studies in a wide variety of 400-level courses, which include prose authors such as historians, poets who wrote in epic and elegiac styles, playwrights, and other literary stylists who round out the vast body of Latin literature. In addition, 400-level courses are available on such topics as Latin prose composition, in which students learn to write Latin, and Latin linguistic history. The minor is appropriate for a wide number of majors, including history, medieval studies, archaeology, medicine, philosophy, and law.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

SUPPORTING COURSES AND RELATED AREAS (18 credits)
Select 12 credits of LATIN courses (Sem: 1-8)
Select 6 credits of 400-level LATIN courses (Sem: 5-8)

LATIN AMERICAN STUDIES MINOR

College of the Liberal Arts
This interdisciplinary minor is designed for students in any college or program of the University who want to supplement their knowledge and skills with the study of Latin America. A certificate is awarded to students who complete the requirements of the minor. A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 30 credits

PRESCRIBED COURSES (9 credits)
HIST 179 GH;GI(3) (Sem: 1-4)
PL SC 456(3), GEOG 440W(3) (Sem: 5-8)

ADDITIONAL COURSES (9 credits)
Select 9 credits (at least 3 credits at the 400 level) from:
HIST 178 GH;GI(3) or SPAN 131 GH;DF(3) (Sem: 1-8)
ECON 471(3) (Sem: 3-6)
ANTH 422(3), ANTH 440(3), COMM 410(3), GEOG 440W(3), HIST 467(3), HIST 468(3), PL SC 457(3-6), PORT 456(3), SPAN 472(3), or SPAN 476(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Spanish or Portuguese language study through the third semester or the equivalent (Sem: 1-4)

LAW AND LIBERAL ARTS MINOR

Commonwealth College; College of the Liberal Arts
This minor is intended for all students who are interested in attending law school after graduation, or who are interested in preparing for careers related to the judicial system and the law. The minor consists of 18 credits that are designed to focus on the acquisition of skills and substantive knowledge in five areas: (1) American public law and judicial process; (2) critical thinking; (3) advanced writing; (4) public speaking; and (5) formal logic. (To complete the minor, students must receive a grade of C or higher in a minimum of 18 credits.)

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (3 credits)
PHIL 012 GQ(3) (Sem: 3-4)

ADDITIONAL COURSES (15 credits)
Select 3 credits from CAS 450W(3), ENGL 421(3), ENGL 471(3), PL SC 470W(3) (Sem: 5-8)
Select 2-3 credits from CAS 213(3), CAS 216(2), CAS 250(3), CAS 321(3) (Sem: 5-8)
Select 3 credits from COMM 403(3), L ST 470(3), PL SC 403(3), PL SC 471(3), PL SC 472(3) (Sem: 5-8)
Select 3 credits from HIST 449(3), HIST 450(3), PL SC 473(3), PL SC 474(3), PL SC 475(3) (Sem: 5-8)
Select 3-4 credits from SOC 405(3) (Sem: 1-8), PHIL 105(3), PHIL 108 GH(3), PHIL 408(3), PHIL 408W(3), PL SC 431(3), PL SC 432(3) (Sem: 5-8)
NOTE: Students majoring in Political Science, International Politics, or Pre Law may not apply for the Law and Liberal Arts Minor.

LEADERSHIP DEVELOPMENT MINOR

College of Agricultural Sciences
This minor is designed for students in any major of the University wanting to supplement their program with studies in leadership development. The minor consists of 18 credits, at least 3 of which are an internship experience. This minor provides students with a fundamental concept of leadership development and expands in three related dimensions. A grade of C or better is required in all courses in the minor.

REQUIREMENTS FOR THE MAJOR: 18 credits

PRESCRIBED COURSES (12 credits)
AEE 311(3), AEE 360(3) (Sem: 5-6)
AEE 460(3), AEE 495(3) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits in consultation with an adviser from courses on the Department approved list that focus in one of three support areas: leadership styles, ethical and moral dimensions of leadership, or global leadership (Sem: 1-8)

LEGAL ENVIRONMENT OF BUSINESS MINOR

Smeal College of Business
This minor presents students with an overview of the civil and criminal law as it impacts upon society and business. It also provides an introduction to general public policies toward business, as well as an understanding of the social responsibilities of business in our society. A certificate is awarded to students upon completion of the 18 credits required for the minor. A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: Minimum of 18 credits (must include at least 6 credits at the 400 level)

ADDITIONAL COURSES
Select 4-6 credits from a) or b) based upon your major:
a) For Business Majors - B A 243(4) or B A 241(2) and B A 242(2) (Sem: 1-8)
b) For Non-Business - B LAW 243(3) and B A 242(2) or PHIL 106(3) (Sem: 1-8)
Select 12 or 14 credits from B LAW 325(3), B LAW 344(3), B LAW 346(3), B LAW 410(3), B LAW 425(3), B LAW 445(3), B LAW 473(3), B LAW 496(1-18), COMM 403(3), INS 400(3), L I R 433(3), MGMT 451W(3), PL SC 472(3), PL SC 473(3), or PL SC 474(3) (Sem: 5-8)

LINGUISTICS MINOR

College of the Liberal Arts
This minor is designed for students in any major of the University who wish to supplement their knowledge in the area of linguistics. The minor consists of 18 credits. A certificate is awarded to students who complete the requirements of the minor. A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (6 credits)
LING 402(3), LING 404(3) (Sem: 5-8)

ADDITIONAL COURSES (3 credits)
LING 001 GS(3) or LING 100(3) (Sem: 1-4)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 9 credits from LING offerings (Sem: 5-8)

MANAGEMENT MINOR

Penn State Erie, The Behrend College
A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (6 credits)
MANGT 300(3), MANGT 310(3) (Sem: 5-6)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 6 credits of MANGT courses (Sem: 5-6)
Select 6 credits of 400-level MANGT courses (Sem: 7-8)

MANAGEMENT INFORMATION SYSTEMS MINOR

Penn State Erie, The Behrend College
A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES: (12 credits)
CMPSC 203 GQ(4) (Sem: 1-2)
M I S 204(2) (Sem: 3-4)
MISBD 336(3), MISBD 430(3) (Sem: 7-8)

SUPPORTING COURSES AND RELATED: (6 credits)
Select 3 credits from CMPBD, CMPSC, or MISBD courses (Sem: 5-6)
Select 3 credits from 400-level CMPBD, CMPSC, or MISBD (Sem: 7-8)

MANAGEMENT INFORMATION SYSTEMS MINOR

Smeal College of Business
This interdisciplinary minor is designed for students in every curriculum at the University. The Management Information Systems courses combined with other functional areas of study will enable students to gain understanding of management information systems design and development, and an understanding of the structure of business information systems. A grade-point average of 2.0 or higher is required for all courses counted toward the minor.

REQUIREMENTS FOR THE MINOR: 20 credits

PRESCRIBED COURSES (8 credits)
M I S 204(2) (Sem: 5-6)
M I S 431(3), M I S 432(3) (Sem: 7-8)

ADDITIONAL COURSES (6 credits)
Select 6 credits of computer programming from CMPSC 101 GQ(3) or CSE 120(3), CMPSC 203 GQ(4), or other computer programming courses approved by the Management Information Systems Minor adviser (Sem: 3-6)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits in consultation with the Management Information Systems minor adviser (Sem: 7-8)

MARINE SCIENCES MINOR

Intercollege

This program provides an opportunity for undergraduates to investigate and prepare for careers in the various marine sciences. Although Penn State does not award degrees in Oceanography, a number of faculty pursue research interests in the Marine Sciences, and a varied selection of undergraduate courses in the Marine Sciences is available. The student can (1) take courses in marine sciences offered at the University Park campus; (2) enroll in the off-campus program offered by Penn State at Wallops Island, VA (see below); (3) take summer courses (listed under Marine Sciences in the Course Description section of this Bulletin) through the Marine Science Consortium, of which Penn State is a member; (4) complete the requirements of the Marine Sciences minor (see below).

Penn State offers an off-campus program during the summer intersession at the Marine Science Consortium field station located at Wallops Island, VA. The program consists of field- and laboratory-oriented courses in coastal geology [GEOSC 445(4)] and coastal biology [BIOL 482(4)]. The program features a low student-to-faculty ratio, the application of theory to practice in the "living lab" of the Wallops' environs, opportunities to participate in independent research geared to the student's talents, and an opportunity for students and faculty from diverse majors to interact on environmental problems. The students selected for the program are drawn from both science and nonscience majors, and no formal requirements exist for participation in the program. Information on this program can be obtained from Linda Spangler, staff assistant, 2217 Earth and Engineering Science Building, University Park campus; 814-863-7091.

MARINE SCIENCES MINOR: The Marine Sciences Committee is authorized to award a minor certificate to any undergraduate student regularly enrolled in a degree program at the University who, in addition to satisfying the degree requirements of his or her baccalaureate major, satisfies the requirements for the Marine Sciences minor. The completion of the minor is reflected by a formal notation on the student's official record at the time of graduation. To enter the program, a student must have attained at least fourth-semester classification and have earned a cumulative grade-point average of at least 2.50. To ensure adequate advising and record keeping, the student must apply for the minor in the Marine Sciences program office and must then complete the requirements shown below.

Courses offered by other institutions may be substituted for any of the required courses listed below, if accepted for transfer by the student's major department and approved by the Marine Sciences Committee, provided that at least 9 of the minimum 18 credits required for the minor are earned in courses offered by Penn State. Upon completion of the requirements and no later than the tenth week of the semester in which the student is to graduate, he or she must verify in the Marine Sciences program office that the requirements have been met. A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18-19 credits

PRESCRIBED COURSES (8-9 credits)
BIOL 435(3) or BIOL 417(4), GEOSC 440(3), METEO 022(2) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (10 credits)
At least 6 credits of field studies, including 3 credits of life sciences and 3 credits of physical sciences [This requirement may be satisfied by BIOL 482(4) plus GEOSC 445(4) offered at Wallops Island.] (Sem: 5-8)
Select 3 credits from Marine Science program approved list of courses (Sem: 5-8)

MARKETING MINOR

Penn State Erie, The Behrend College

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (9 credits)
MRKTG 300(3), MRKTG 310(3), and MRKTG 320(3) (Sem: 5-6)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 9 credits of MRKTG courses (at least 6 credits at the 400 level) (Sem: 5-8)

MATHEMATICS MINOR

Altoona College, Eberly College of Science

The minor is designed to provide students with an interest in mathematics an opportunity to study a broad range of mathematical topics. The requirements allow students a great deal of flexibility in choosing courses of interest.

To earn the mathematics minor, students must take MATH 140 GQ(4) and MATH 141 GQ(4); select 6-8 credits from MATH 220 GQ(2), MATH 230(4), MATH 231(2), MATH 232(2),MATH 250(3), MATH 251(4), MATH 310(3), MATH 311W(3), or MATH 312(3); and select 12 credits from 400-level MATH courses. A total of 26-28 credits is required for the minor.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 26-28 credits

PRESCRIBED COURSES (8 credits)
MATH 140 GQ(4), MATH 141 GQ(4) (Sem: 1-4)

ADDITIONAL COURSES (6-8 credits)
Select 6-8 credits from MATH 220 GQ(2), MATH 230(4), MATH 231(2), MATH 232(2), MATH 250(3), MATH 251(4), MATH 310(3), MATH 311W(3), or MATH 312(3) (Sem: 1-4)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 12 credits of 400-level MATH courses (Sem: 5-8)

MATHEMATICS MINOR

Penn State Erie, The Behrend College

The minor in mathematics (MTHBD) shows students how to use mathematical tools and ways of thinking in many fields. The choice of several upper-level courses allows students to focus on specific areas of interest. Business majors might choose linear programming and operations research. Engineering students could enroll in numerical methods. Chemistry students might choose numerical methods and linear programming, while biology majors could enroll in mathematical modeling and differential equations. A solid mathematical background can be a strong asset in fields of education, neurobiology and behavior, plant biology and agriculture, immune system studies and pathology, medical sciences, marketing and management science, engineering, national security, ecology, and ecosystems.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (4 credits)
MTHBD 315W(4) (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (14 credits)
Select 8 credits of MATH or MTHBD courses at the level of MATH 140 GQ(4) or above (Sem: 1-6)
Select 6 credits of 400-level MATH or MTHBD courses (Sem: 7-8)

MEDIA STUDIES MINOR

College of Communications

The Media Studies minor is designed for students who want to develop their knowledge of the mass media from a variety of approaches, including aesthetic, humanistic, social-behavioral, and legal-policy. This minor is a theory-based rather than a professional program. In fact, students in the minor may not take professional skills communications courses as part of this program. The minor consists of 18 credits, at least 6 of which must be at the 400 level. The minor is not available to students enrolled in any of the majors in the College of Communications. A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (3 credits)
COMM 100(3) (Sem: 1-2)

ADDITIONAL COURSES (15 credits)
Select 3 credits from COMM 150 GA(3) or COMM 180(3) (Sem: 3-6)
Select 12 credits from COMM 205 GI(3), COMM 250 GA(3), COMM 261(3), COMM 401(3), COMM 403(3), COMM 405(3), COMM 408(3), COMM 409(3), COMM 410(3), COMM 411(3), COMM 413(3), COMM 419(3), COMM 450(3), COMM 451(3), COMM 452(3), COMM 453(3), COMM 454(3), COMM 455(3), COMM 483(3), COMM 484(3), COMM 485(3), COMM 496(3), or COMM 499(3) (Sem: 5-8)

METEOROLOGY MINOR

College of Earth and Mineral Sciences

The pursuing the 19-credit Meteorology minor seek to broaden their education by specializing in an applied science. As for Meteorology majors, students minoring in Meteorology must have a strong background in

Mathematics and Physics. Ten of the 19 credits come from the three required courses of METEO 300, METEO 421, and METEO 431. The remaining nine credits come from 100-, 200-, 300-, or 400-level METEO courses, at least one of which must be at the 400 level. Completion of the three required courses ensures that students will have the foundational atmospheric science material that they need to register for the remaining nine Meteorology credits. In consultation with a Meteorology adviser, students may choose these elective courses from a variety of sub-specialties, including Air Quality Studies, Atmospheric Dynamics, Atmospheric Physics, Climatology, Computer Applications, and Weather Analysis and Forecasting.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 19 credits

PRESCRIBED COURSES (10 credits)
METEO 300(3), METEO 421(4), METEO 431(3) (Sem. 5-6)

ADDITIONAL COURSES (9 credits)
Select 9 credits of 100-, 200-, 300-, or 400-level Meteorology; at least 3 credits must be at the 400 level. (Sem. 5-8)

MICROBIOLOGY MINOR

Eberly College of Science

The minor in Microbiology is a collection of required and elective courses that (1) provides a limited but sound foundation in the discipline, (2) requires students to develop reasonable expertise in handling and characterizing microorganisms, and (3) permits students to emphasize some subdiscipline of microbiology in which they may have a particular interest. The minor specifies the introductory lecture and laboratory courses in microbiology and one course each in immunology and cell biology. A minimum of two laboratory courses exposes students to basic and experimental/applied techniques. Sufficient room exists within the minor for selection of two or three elective courses at the advanced level that may emphasize a specialty area of the discipline such as virology or microbial genetics. Students who complete the minor have a sufficient background to pursue positions in industry that require an appreciable expertise in microbiology.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (11 credits)
MICRB 201(3), MICRB 202(2), MICRB 251(3) (Sem: 3-4)
MICRB 410(3) (Sem: 5-6)

ADDITIONAL COURSES (2-3 credits)
Select 2-3 credits from MICRB 421W(3) or MICRB 422(2) (Sem: 5-6)

SUPPORTING COURSES AND RELATED AREAS (4-5 credits)
Select 4-5 of 400-level MICRB courses (Sem: 5-8)
NOTE: MICRB 400(2), MICRB 408(1-2), MICRB 496(1-18) and MICRB 497(1-9) may not be used to fulfill the requirements for the minor.

MIDDLE EAST STUDIES MINOR

College of the Liberal Arts

This program is designed for students having special interest in the geographical area that includes Afghanistan, Iran, Turkey, and the Arabic-speaking countries of southwestern Asia and northern Africa. In addition to the requirements for the minor, students may select other courses dealing with the Middle East, subject to the approval of the Middle East Studies Committee. A certificate is awarded to students who complete the requirements of the minor.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits
(Some courses in this minor have prerequisites that are not required by the minor.)

ADDITIONAL COURSES (3 credits)
Select 3 credits from HIST 165(3) HIST 181 GH;GI(3), HIST 471W(3), HIST 472(3), HIST 473(3), RL ST 107 GH;DF(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (15 credits)
Select 15 credits, at least 6 at the 400-level, from approved program list in consultation with the professor in charge of the minor. (Sem: 5-8)

MILITARY STUDIES MINOR

Intercollege, Reserve Officers' Training Corps

This interdisciplinary minor is designed for all students with special interests in military and national security affairs. Military emphasis is provided in one of three areas—Aerospace Studies, Military Science, or Naval Science. American military forces have played an important role in our domestic and international history and will continue to have significant involvement in policy arenas relating to national security and international relations. Students elect one military service branch for their prescribed courses and select two additional courses from appropriate history and political science courses emphasizing national security policy. At least 6 credits must be taken at the 400 level.

REQUIREMENTS FOR THE MINOR: 19-26 credits

PRESCRIBED COURSES (Choose one service branch—13-20 credits)

AIR FORCE (20 credits)
AIR 151(2), AIR 152(2), AIR 251(2), AIR 252(2), AIR 351(3), AIR 352(3), AIR 451(3), AIR 452(3) (Sem: 1-4)

ARMY (20 credits)
ARMY 101(2), ARMY 102(2), ARMY 203(2), ARMY 204(2), ARMY 301(3), ARMY 302(3), ARMY 401(3), ARMY 402(3) (Sem: 1-7)

MARINES (13 credits)
NAVSC 101(2), NAVSC 203(3), NAVSC 204(2), NAVSC 311(2), NAVSC 313(2), NAVSC 411(2) (Sem: 1-7)

NAVY (18 credits)
NAVSC 101(2), NAVSC 203(3), NAVSC 204(2), NAVSC 302(3), NAVSC 322(3), NAVSC 402(2), NAVSC 421(3) (Sem: 1-7)

ADDITIONAL COURSES (6 credits)
Select 6 credits from the following courses:
HIST 142 GS(3), HIST 143 GH(3), HIST 144(3), HIST 151 GS(3), HIST 160(3), HIST 173 GH(3), HIST 181 GH;GI(3), HIST 420(3), HIST 430(3), HIST 441(3), HIST 444(3), HIST 452(3), HIST 454(3) (Sem: 1-2, 7-8)
PL SC 014 GS(3), PL SC 020 GS(3), PL SC 022 DF(3), PL SC 413(3), PL SC 414(3), PL SC 416(3), PL SC 438(3), PL SC 442(3), PL SC 452(3), PL SC 456(3), PL SC 466(3), PL SC 467(3) (Sem: 1-2, 7-8)

MINING ENGINEERING MINOR

College of Earth and Mineral Sciences

The minor in Mining Engineering offers a specialized program for students in many other broad-based, technical majors, such as those in engineering or science. The demand for professionals with the training and skills for a career in the minerals- and energy-recovery profession far exceeds the supply. Mineral exploration and evaluation, mine development, marketing, health and safety, environmental protection, and mine management are all areas of industry employment. It is recommended that students wishing to pursue this minor come from an engineering or science major. As a result, the selection of this minor can provide additional career options for students in a wide range of offerings at Penn State.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (18 credits)
MNG 030(2), MNG 404(2), MNG 410(2), MNG 412(3), MNG 422(3), MNG 431(3), and MNG 441(3) (Sem: 3-8)

MOVEMENT SCIENCE MINOR

College of Health and Human Development

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18-19 credits

ADDITIONAL COURSES (6-7 credits)
Select 6-7 credits from KINES 141(3), KINES 180(3), and KINES 202(4) (Sem: 1-4)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 6 credits of 100-level or higher Kinesiology courses (Sem: 3-6)
Select 6 credits of 400-level Kinesiology courses (Sem: 7-8)

MUSHROOM SCIENCE AND TECHNOLOGY MINOR

College of Agricultural Sciencest

This interdisciplinary minor is designed to prepare students for a career in the mushroom industry. The minor offers practical work experience at the University's Mushroom Research Center and Mushroom Test Demonstration Facility.

Students are required to complete a minimum of 21 credits. The core of prescribed courses provides a foundation in the basic fundamentals of mushroom science and technology. Independent study courses may be selected by the student to emphasize various aspects of Agaricus or specialty mushroom production. A period of internship or a field experience is required. A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 21-22 credits

PRESCRIBED COURSES (16 credits)
ENT 012(3) (Sem: 3-8)
AG 495(4), BIOL 418(4), PPATH 405(3), PPATH 496(2)[7] (Sem: 5-8)

ADDITIONAL COURSES (2-3 credits)
Select 2-3 credits from AG 200A(2), AG 200B(2), MGMT 100(3) (Sem: 3-8)

SUPPORTING COURSES AND RELATED AREAS (3 credits)
Select 3 credits at the 400 level from department list (Sem: 5-8)

MUSIC MINOR

College of Arts and Architecture

The minor in music serves a wide variety of needs among the students who elect it. Those who have studied voice or an instrument through their high school years may pursue that study at a more advanced level. Participants in bands, orchestras, and choirs want to continue that activity at a higher level. Some find the minor an important adjunct to other studies such as speech pathology and audiology, speech communication, or broadcasting. Those in very demanding majors build music into their lives as a balancing influence. Other students relate music studies to their major; a recent Schreyer Honors College history major did her thesis on song during the Civil War. Admission to the minor depends upon a successful performance audition. Minors enroll for the same sequence of performance levels as do the B.A. and B.S. music majors. Each student registers for core courses in music theory, history, and performance. Students usually opt to focus on one of the three areas in their upper-level courses.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 28 credits

PRESCRIBED COURSES (12 credits)
MUSIC 121(1), MUSIC 122(1), MUSIC 131(2), MUSIC 132(2) (Sem: 1-2)
MUSIC 261(3), MUSIC 262(3) (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (16 credits)
Select 8 credits in applied music through Level IV: Primary (Sem: 1-8)
Select 8 credits (at least 6 at 400 level) in MUSIC [or Brass, or Keyboard, Percussion, Strings, Voice, or Woodwinds] (Sem: 5-8)

NATURAL SCIENCE MINOR

Altoona College, Berks-Lehigh Valley College: Penn State Berks; Eberly College of Science

This interdepartmental minor in Natural Science is designed for nonscience students who wish to gain a better appreciation for science and the scientific method. The courses required in the minor include 3 to 4 credits of general education science designed for nonscience students, 3 to 4 credits of mathematical science, 8 to 9 credits of life or physical science, including some laboratory work, and 6 credits of 400-level science courses. Certain combinations of courses are disallowed (as listed in the curriculum description), and higher-level courses are generally accepted as substitutes for lower-level courses if both are offered by the same department. Any substitutes for laboratory courses must also be laboratory courses. Advising for students in this minor will be available through the Eberly College of Science Academic Advising Center and approval of curriculum exceptions will be through the faculty committee and professor in charge of the program. A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 20-23 credits

PRESCRIBED COURSE (1 credit)
SC 400(1) (Sem: 5-8)

ADDITIONAL COURSES (14-17 credits)[62]
Select 3-4 credits from ASTRO 001 GN(3), ASTRO 010 GN(2) and ASTRO 011 GN(1), B M B 001 GN(3), BI SC 001 GN(3), BI SC 002 GN(3), BI SC 003 GN(3), BI SC 004 GN(4), CHEM 001 GN(3), CHEM 002 GN(3), MICRB 106 GN(3) and MICRB 107 GN(1), PHYS 001 GN(3) (Sem: 1-4)
Select 3-4 credits from CMPSC 101 GQ(3), CMPSC 201C GQ(3) or CMPSC 201F GQ(3), CMPSC 203 GQ(4), CSE 103 GQ(4), MATH 110 GQ(4), MATH 140 GQ(4), STAT 200 GQ(4), STAT 250 GQ(3) (Sem: 3-6)
Select 8-9 credits from BIOL 011 GN(3) and BIOL 012 GN(1), BIOL 110 GN(4), CHEM 012 GN(3) and CHEM 014 GN(1), CHEM 013 GN(3) and CHEM 015 GN(1), MICRB 201(3) and MICRB 202(2), PHYS 250 GN(4), PHYS 251 GN(4) (Sem: 3-8)

SUPPORTING COURSES AND RELATED AREAS (5 credits)
Select 0-2 credits of 496 (independent studies) courses from the Eberly College of Science course offerings (Sem: 5-8)
Select 3-5 credits of 400-level courses (other than independent studies) from the Eberly College of Science course offerings (Sem: 5-8)
NOTE: [62] A student may not use credit for BI SC 001 GN(3) or BI SC 002 GN(3) along with credit for BIOL 011 GN(3) & BIOL 012 GN(1), or BIOL 110 GN(4); CHEM 001 GN(3) or CHEM 002 GN(3) along with credit for CHEM 012 GN(3) and CHEM 014 GN(1) or CHEM 013 GN(3) and CHEM 015 GN(1); PHYS 001 GN(3) along with credit for PHYS 250 GN(4 or PHYS 251 GN(4); MICRB 106 GN(3) & MICRB 107 GN(1) along with credit for MICRB 201(3) & MICRB 202(2).

NEUROSCIENCE MINOR

Intercollege
The intercollege intercollege minor in neuroscience is designed for the student desiring an in-depth knowledge about the basic and functional aspects of the nervous system. Students in several disciplines ranging from nutrition to psychology to molecular biology could benefit from comprehensive study of the neurosciences in preparation for technical, professional, or research careers. The neurosciences as envisioned here are broadly based, and instruction available spans the levels of investigation from molecular to behavioral and cognitive. Majors complemented by this minor would include, but not be limited to, psychology, biology, biochemistry, nutrition, human development and family studies, genetics, biobehavioral health, kinesiology, and animal and poultry science and veterinary science. Only courses in which the student earns a grade of C or better may be counted toward fulfillment of the requirements for the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (9 credits)
PSY 203(3) (Sem: 3-4)
BIOL 469(3), BIOL 470(3) (Sem: 5-6)

ADDITIONAL COURSES (9 credits)
Select 9 credits from BB H 410(3), BB H 432(3), BB H 451(3), BB H 497(1-9) (lab), BIOL 471(3), BIOL 472(3), BIOL 473(2), BIOL 479(3), KINES 451(3), KINES 483(3), KINES 484(3), PSY 402(3), PSY 405(3), PSY 456(3), PSY 483(3), PSY 484(3), PTYSC 455(2) (Sem: 5-8)

NUTRITIONAL SCIENCES MINOR

College of Health and Human Development
A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (11 credits)
NUTR 251 GHA(3) (Sem: 1-4)
NUTR 358(2) (Sem: 3-6)
NUTR 445(3), NUTR 446(3) (Sem: 5-6)

SUPPORTING COURSES AND RELATED AREAS (7 credits)
Select 7 credits from NUTR courses (Sem: 5-8)

OFF-ROAD EQUIPMENT MINOR

College of Agricultural Sciences
This interdisciplinary minor complements several engineering, agricultural, and mining degrees, helping students understand some specific technological aspects of mobile equipment (from lawn tractors to large excavators). The minor would strengthen the program for students with machinery interests by exposing them to several of the technical aspects of off-road equipment such as electronics, power generation, power transmission, traction, ergonomics, and safety.

The minor in Off-Road Equipment requires 18-19 credits from the approved courses. Courses in the minor have prerequisites including calculus, physics, and, depending on the student's major, at least one engineering or engineering technology type course (e.g., A S M 221). These courses should be completed prior to entering the minor.

A grade of C or better is required for all courses taken to satisfy the minor.

REQUIREMENTS FOR THE MINOR: 18-19 credits

PRESCRIBED COURSES (3 credits)
A S M 420(3) (Sem: 6-8)

ADDITIONAL COURSES (15-16 credits)
Select 3 credits from A S M 320(3) or M E 413(3) (Sem: 5-8)
Select 3 credits from A B E 403(1.5) and A B E 406(1.5), or A S M 310(3) or ME 051(3) (Sem: 5-8)
Select 3 credits from A B E 405(3), A S M 428(3), or M E 082(3) (Sem: 5-8)
Select 3-4 credits from FOR 339(3), A S M 424(3), AGRO 425(3), HORT 408(4), or TURF 425(3) (Sem: 5-8)
Select 3 credits from A B E 461(3) or A S M 426(3) (Sem: 5-8)

OPERATIONS MANAGEMENT MINOR

Smeal College of Business

This minor is designed to accommodate undergraduates in the University who wish to augment their majors with further studies in production and operations management either in the manufacturing or service industries. The objective of the minor is to acquaint students with the issues and methods associated with managing manufacturing and service systems. Relevant subjects for this study include statistical process control, system simulation, planning, scheduling, and control of business operations, managing the flow of materials in business operations, and total quality management. Students must receive a grade of C or better in all courses required for the minor.

REQUIREMENTS FOR THE MINOR: 20 credits

PRESCRIBED COURSES (11credits)
MS&IS 391(2) (Sem. 5-6)
OISM 418(3), OISM 470W(3), OISM 476(3) (Sem. 5-8

ADDITIONAL COURSES (9 credits)
B A 302(3) or B LOG 301(3) (Sem. 5-6)
Select 3 credits from 300- and 400-level MGMT courses (Sem. 5-8)
Select 3 credits from B LOG 432(3), M I S 431(3), OISM 455(3), or MS&IS courses at the 400 level (Sem. 5-8)

PEACE AND CONFLICT STUDIES MINOR

College of Engineering

This minor may be pursued by students in any major. It is designed to help students take a coherent set of courses organized around the study of the sources of international conflict, peace movements, and peace building. The minor requires 18 credits, of which at least 9 must be upper division, including 6 credits at the 400 level. Students will be required to take two prescribed courses in Science, Technology, and Society, one introductory and one capstone. They also will take 6 credits of additional courses with an international focus and 6 credits from a list of supporting courses, which includes the study of conflict in race relations, family, community, and the development of personal peace as a precursor to peace building. The full requirements with the lists of additional and supporting courses are available in the Science, Technology, and Society program office, 133 Willard Building, University Park Campus. Substitutions for requirements, such as that necessary for Political Science majors taking an alternative to PL SC 014 GS(3), require the permission of the Peace and Conflict Studies minor adviser or the director of the Science, Technology, and Society program. A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (6 credits)
S T S 090(3) (Sem: 1-4)
S T S 490(3) (Sem: 7-8)

ADDITIONAL COURSES (3 credits)
INT U 200 GS(3) or PL SC 014 GS(3) (Sem: 3-8)
(INT U 200 GS(3) and PL SC 014 GS(3) cannot both be taken for credit)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 3 credits from the additional course list in the S T S program office (Sem: 3-8)
Select 6 credits from the supporting course list in the S T S program office (Sem: 3-8)

PENNSYLVANIA STUDIES MINOR

College of the Liberal Arts

This minor minor is for students who want to emphasize the history, culture, politics, and other important features of Pennsylvania in their academic programs. The minor consists of 18 credits, at least 6 of which must be at the 400 level. A certificate is awarded to students who complete the requirements of the minor. A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (3 credits)
HIST 012 GH(3) (Sem: 1-4)

ADDITIONAL COURSES (6-9 credits)
Select 6-9 credits from GEOG 200(3), GER 157 GH;GI(3), HIST 150(3), HIST 200(3), AM ST 050 GH(3), or PL SC 125(3) (Sem: 3-6)

SUPPORTING COURSES AND RELATED AREAS (6-9 credits)
Students may select, in consultation with their Pennsylvania Studies adviser, 6-9 credits from among courses that focus substantially on Pennsylvania. At least 6 credits must be at the 400 level. A partial list of such courses includes L I R 100 GS(3), L I R 433(3), L A 496(1-18), PL SC 130(3), PL SC 426(3), SOC 454(3). With the approval of the Pennsylvania Studies adviser, students may count up to 3 credits for internships in Pennsylvania. Students may enroll in the College of the Liberal Arts internship program or a departmental internship program. (Sem: 3-8)

PHILOSOPHY MINOR

Abington College; Commonwealth College; College of the Liberal Arts

Many students find that their studies in their major field can be profitably supplemented by pursuing their studies in Philosophy. The Philosophy minor is designed for students who desire a significant background in Philosophy while majoring in a different field. Students from many disciplines pursue Philosophy minors, including English, History, Physics, Mathematics, Management Studies, and so on. Declaring a minor in Philosophy will allow you to continue your Philosophy studies throughout your degree, and you will receive a certificate in Philosophy when you graduate.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

SUPPORTING COURSES AND RELATED AREAS (18 credits)
In consultation with a faculty adviser:
Select 6 credits of Philosophy courses (Sem: 1-6)
Select 6 credits of Philosophy courses at the 200 level (Sem: 3-6)
Select 6 credits of Philosophy courses at the 400 level (Sem: 5-8)

PHYSICS MINOR

Penn State Erie, The Behrend College

Physics is the ffundamental science from which many fields of engineering and science developed. With the increasing pace of technological change, solid understanding of basic physics can make the student adaptable and competitive in a rapidly changing workforce. The minor in physics (PHYBD) can be valuable to students seeking careers in engineering, chemistry, medicine, teaching, or computing. Many science or engineering majors can earn a physics minor with as few as ten additional credits. The minor can be tailored to specific interests with courses such as optics, quantum mechanics, solid-state physics, or electronics.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 22 credits

PRESCRIBED COURSES (15 credits)
PHYS 211 GN(4), PHYS 212 GN(4), PHYS 213 GN(2), PHYS 214 GN(2), PHYS 237(3) (Sem: 1-4)

SUPPORTING COURSES AND RELATED AREAS (7 credits)
Select 7 credits from 400-level PHYBD courses, excluding PHYBD 494, PHYBD 495, PHYBD 496, and PHYBD 497 courses (Sem: 5-8)

PHYSICS MINOR

Eberly College of Science

The Department of Physics offers a minor for students who wish to expand upon their study in this fundamental discipline, beyond the introductory courses (PHYS 211, PHYS 212, PHYS 213, PHYS 214). In addition to an additional course in modern physics (which includes introductions to relativity and quantum theory, as well as applications), students are required to take the 'core' of the junior-senior level Physics curriculum, with classes in advanced classical mechanics, electricity and magnetism, and quantum mechanics. Students also select from one of three possible laboratory courses (optics, electronics, or general physics lab methods) to complete the requirement for the minor. The Physics minor is useful for students in many science (especially astronomy/astrophysics and chemistry) and engineering disciplines who wish to extend their studies in this fundamental field, as a background for graduate study or work in a variety of technical fields.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 25 credits

PRESCRIBED COURSES (25 credits)
PHYS 211 GN(4), PHYS 212 GN(4), PHYS 213 GN(2), PHYS 214 GN(2), PHYS 237(3) (Sem: 1-4)
PHYS 400(3), PHYS 410(4), PHYS 419(3) (Sem: 5-8)

PLANT PATHOLOGY MINOR

College of Agricultural Sciences

This interdisciplinary minor in Plant Pathology is designed to aid student preparation for employment in agricultural and horticultural sciences requiring knowledge of plant health and to prepare students for graduate studies in fields of plant biology. This minor may be designed to supplement majors in any field of the biological sciences.

Plant Pathology is a science concerned with understanding the causes of plant diseases and the utilization of this knowledge for the development of ecologically sound and sustainable control strategies. Students completing this minor will gain knowledge of microbe-plant interactions, molecular mechanisms of pathogenesis and genetic resistance, abiotic stresses, and environmental factors influencing control of plant disease.

The minor in Plant Pathology requires 19 credits in approved courses in addition to the major requirements of the student's choice. Students must receive a grade of C or better in all courses required for the minor. For admission to the minor, contact the Department of Plant Pathology.

REQUIREMENTS FOR THE MINOR: 19 credits

PRESCRIBED COURSES (3 credits)
PPATH 405(3) (Sem: 5-6)

ADDITIONAL COURSES (13 credits)
Select a minimum of 10 credits from the following:
BIOL 230W GN(4) (Sem: 3-4)
PPATH 318(4) (Sem: 3-8)
E R M 430(3), PPATH 416(2 or 4), PPATH 417(2 or 4), PPATH 419(2 or 4) (Sem: 5-8)
Select a minimum of 3 credits from PPATH 400(2) or PPATH 496(1-3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (3 credits)
Select 3 credits from department list, with approval of Minor Adviser (Sem: 5-8)

NOTE: The POLITICAL SCIENCE MINOR (Altoona) was added after press deadline. See www.psu.edu/bulletins/bluebook.

POLITICAL SCIENCE MINOR

Commonwealth College; College of Liberal Arts

The Political Science minor consists of 18 credits with at least one course in each of the following Political Science areas: American, theory/methodology, comparative, and international relations. Six (6) of these 18 credits must be at the 400 level.

When electing this minor, the student should have junior (5th semester) standing. Special attention should be given to the fact that courses used to satisfy general education, degree requirements, electives, and major requirements may also be used to satisfy minor requirements.

A grade of C or better is required for all courses in the minor. Please pick up an application in the Political Science Department's Undergraduate Office in 111 Burrowes Building.

REQUIREMENTS FOR THE MINOR: 18 credits

ADDITIONAL COURSES (18 credits)
Select 18 credits in Political Science (at least 6 credits at the 400 level) (Sem: 3-8)
Include at least one course in each of the following areas: American, Comparative, International Relations, and Theory

POLITICAL SCIENCE MINOR

Penn State Erie, The Behrend College

The study of politics consists of several related subfields, such as American Government, public policy and administration, comparative politics or the study of foreign governments, international relations, and political theory. Students who pursue this minor are expected to develop research and writing skills, in addition to critical analytical skills. Because the policy making process and the processes of globalization affect us in virtually all areas of our lives, the minor is appropriate for supporting the study of any of the majors offered at the College. Similarly, the minor provides an invaluable understanding of the political world that is useful in any career that has an impact on or is affected by public life. Students who study politics at Behrend also often pursue graduate professional studies in law or in other fields in graduate schools.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (6 credits)
PL SC 001 GS(3), PL SC 003 GS(3) (Sem: 1-4)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 12 credits (at least 6 credits at the 400 level) from PL SC or POLSC courses (Sem: 5-8)

POLYMER SCIENCE MINOR

College of Earth and Mineral Sciences

The goal of the polymer science minor is to produce graduates who have a first-hand knowledge of the relationships between the synthesis, structure, properties and processing of polymer materials. Students are required to take MATSE 443 (3 credits), which provides a broad overview of the subject, then select 15 credits chosen from a suite of courses that deal with polymer synthesis, microstructure and morphology, properties and processing.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (3 credits)
MATSE 443(3) (Sem: 5-8)

ADDITIONAL COURSES (15 credits)
Select 12 credits from MATSE 441(3), MATSE 442(3), MATSE 444(3), MATSE 445(3), and MATSE 446(3) (Sem: 5-8)
Select 3 credits from B M B 474(2), CH E 441(3), CHEM 455(3), E MCH 446(3), MATSE 473(1), MATSE 474(1), MATSE 447(3), MATSE 494W(3), or MATSE 496(1-3) (Sem: 5-8)

PRODUCT REALIZATION MINOR

College of Engineering

This interdisciplinary minor is designed for students in all engineering disciplines who are interested in engineering practice in integrated design and manufacturing. The program culminates with a one- or two-semester project involving the design and manufacture of a new product. The purpose of the minor is to offer students state-of-the-art practice in integrated product/process design and manufacturing. Students completing the minor should: (1) understand the interaction of design and manufacturing through practical examples, (2) be familiar with the entrepreneurial skills needed to transfer a new product from initial idea to market, (3) understand the technical and management aspects of concurrent engineering and total quality management, and (4) have hands-on experience in designing and manufacturing a product, organizing and managing the effort, and interacting with the customer. A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 21 credits

PRESCRIBED COURSES (9 credits)
M E 288(3) (Sem: 1-4)
ENGR 407(3) (Sem: 5-6)
I E 466(3) (Sem: 5-8)

ADDITIONAL COURSES (12 credits)
Select 6 credits in manufacturing processes: laboratory-oriented manufacturing process courses as approved by the coordinator (Sem: 5-8)
Select 3 credits in Quality Engineering: I E 423(3) or I E 424(3) (Sem: 7-8)
Select a 3-credit senior project: team-based design or industrial projects course, as approved by the coordinator (Sem: 7-8)

PROFESSIONAL WRITING MINOR

Berks-Lehigh Valley College: Penn State Berks, Penn State Lehigh Valley
The minor in Professional Writing is intended to prepare students from all degree programs within the Berks-Lehigh Valley College (with the exception of the major in Professional Writing) to write effectively in a variety of workplace and academic settings. Theory courses provide the necessary background to help students understand and appreciate the larger issues surrounding the writing and reading of texts. At the same time, practice-oriented courses draw upon the strategies and techniques of practicing writers outside and inside of the University, including workshops, peer conferencing, collaborative writing, portfolio preparation, and internships.

Students may not count courses used to satisfy General Education Writing/Speaking Skills. A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (6 credits)
ENGL 210(3) (Sem: 3-6)
ENGL 417(3) (Sem: 7-8)

ADDITIONAL COURSES (12 credits)
Select 12 credits from the following list:
ENGL 215(3), ENGL 250(3), ENGL 415(3), ENGL 416(3), ENGL 421(3) (Sem: 3-8)
ENGL 471(3) (Sem: 5-6)
ENGL 418(3), ENGL 419(3), ENGL 472(3), ENGL 473(3) (Sem: 5-8)

PSYCHOLOGY MINOR

Abington College; Altoona College; Commonwealth College: Penn State Beaver, Fayette, McKeesport, New Kensington; College of the Liberal Arts
The Psychology minor is designed to provide undergraduate students with a broad overview of topics and domains within psychology, knowledge and skills related to research methods in psychology, and deeper knowledge of research, theory, and application in one or two specific content domains. Students completing this minor will find a flexible selection of course work in psychology. The content domains from which students may select courses include biological, clinical, cognitive, developmental, industrial-organizational, and social psychology. Students may choose courses that emphasize theory or application of psychological principles. A number of these courses examine the application of psychological research to societal issues.

A grade of C or better is required for all courses in the minor. The required research methods course, PSY 201W, carries a statistics prerequisite that can be met by either PSY 015 or STAT 200. STAT 200 does not count toward the minimum 18 credits required for the minor. Students minoring in Psychology at University Park are encouraged to consult the Psychology Advising Center early in the process of planning their minor.

The Psychology minor may be appropriate for students pursuing graduate training or professional careers in fields such as health, business, education, and human services, as well as in psychology.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (7 credits)
PSY 002 GS(3), PSY 201W(4) (Sem: 1-4)

ADDITIONAL COURSES (11 credits)
Select 11 credits (at least 6 credits at the 400 level) in PSY (Sem: 5-8)

PSYCHOLOGY MINOR

Penn State Erie, The Behrend College
A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (3 credits)
PSY 002 GS(3) (Sem: 1-4)

SUPPORTING COURSES AND RELATED AREAS (15 credits)
Select 15 credits (at least 6 credits at the 400-level) from PSY or PSYCH courses (Sem: 5-8)

REAL ESTATE MINOR

Smeal College of Business

Real Estate is a minor designed to prepare students for a career in a number of related areas including brokerage, appraisal, development, investment counseling, and mortgage lending. The minor is designed to supplement for such majors in any field of business administration, most often finance or insurance.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (15 credits)
INS 301(3), R EST 301(3), R EST 306(3), R EST 325(3), R EST 409(3) (Sem: 5-8)

ADDITIONAL COURSES (3 credits)
Select 3 credits from R EST 425(3), R EST 440(3), or R EST 450W(3) (Sem: 5-8)

RECREATION AND PARK MANAGEMENT MINOR

College of Health and Human Development

The minorin Recreation and Park Management provides an introduction to recreation/leisure services, and emphasizes professional skills essential for successful delivery of these services. Examples of settings offering recreation/leisure services include resorts, theme parks, convention centers, sports and fitness facilities, private corporations, nonprofit agencies, governmental agencies (municipal, state, and federal levels), armed services, colleges and universities, correctional facilities, camps, public parks, nature centers, hospitals and other health care agencies.

Students who minor in Recreation and Park Management gain knowledge and competencies in recreation leadership, program development and implementation, and administration of recreation services. In addition, students explore the relevance of recreation and leisure in their own lives. Support courses enable the student to focus on specialized services, such as commercial recreation and tourism, community recreation, park management, environmental interpretation, or therapeutic recreation. A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 20 credits

PRESCRIBED COURSES (14 credits)
R P M 101(2), R P M 120(3) (Sem: 1-4)
R P M 236(3), R P M 356(3), R P M 465(3) (Sem: 3-6)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits of 400-level R P M courses (Sem: 5-8)

RELIGIOUS STUDIES MINOR

College of the Liberal Arts

The minor Religious Studies requires 18 hours of course work in RL ST. It (1) acquaints the student with the methods for studying religion (how one studies a religion), (2) provides an elementary introduction to the world's main religious traditions (names, dates, ideas, similarities and differences), and (3) offers the opportunity to investigate a particular topic or religion in greater detail. Students are required to take one survey course (either RL ST 001, RL ST 003, or RL ST 004), which provides a broad historical overview of several religions, from their foundation to the present day.

The interaction between religions and their cultural contexts is emphasized, as is the evolution of an individual religion. After this introduction, the student is free to choose from a broad array of courses on the psychological, sociological, historical, and textual aspects of religions, both living and dead, both familiar and foreign. For example, a student may study Hinduism, Islam, Christianity, Norse religion, Greco-Roman religion, or the sociological aspects of religions. Reading skills and critical thinking skills are important and will be further developed in the courses.

The minor is excellent preparation for a career in the professions (law, medicine), and many students use this classical humanities topic to augment a major in the pure sciences.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

ADDITIONAL COURSES (3 credits)
Select 3 credits from RL ST 001 GH;GI(3), RL ST 003 GH;GI(3), or RL ST 004 GH;GI(3) (Sem: 1-6)

SUPPORTING COURSES AND RELATED AREAS (15 credits)
Select 15 credits (at least 6 credits at the 400-level) in Religious Studies (Sem: 3-8)

RUSSIAN MINOR

The College of the Liberal Arts

The Russian minor is designed for students who want to study the language, literature, and culture of Russia in order to broaden their horizons and meet an increasing demand for people with foreign language skills and international expertise. Russian is a major world language with a rich cultural and scientific heritage. It is spoken throughout the former Soviet Union and widely understood in the countries of Eastern Europe.

The Department of Germanic and Slavic Languages and Literatures offers an array of courses in Russian language, literature, and culture. Study abroad in Russia at St. Pertersburg University under the University's study abroad program is available. For the Russian minor, students must select courses (at least 6 credits at the 400 level) in Russian to account for 18 credits. A grade of C or better is required for all courses in the minor.

The Russian minor opens employment opportunities for its graduates in fields and professions where proficiency in one or more foreign languages is desirable or required. Graduates of this program have found employment with businesses having contact with the former Soviet Union, with various agencies of the U.S. government, in the educational and publishing fields, and in the travel industry.

REQUIREMENTS FOR THE MINOR: 18 credits

SUPPORTING COURSES AND RELATED AREAS (18 credits)
Select 12 credits of Russian courses (Sem: 3-6)
Select 6 credits of 400-level Russian courses (Sem: 5-8)

RUSSIAN AREA STUDIES MINOR

The College of the Liberal Arts

The Russian Area Studies minor is an interdisciplinary program supervised by the Center for Russian and East European Studies and the Department of Slavic and East European Languages designed to combine a regional specialization with an academic disciplinary major. The minor may be combined with any undergraduate major in the University. It requires 15 credits in approved Area Studies courses (6 must be at the 400 level or above), 12 credits in beginning Russian language or the equivalent, and 6 credits of Russian language at the 200 level or above, as well as the baccalaureate degree and departmental major requirements of the student's choice. Only courses in which the student earns a grade of C or better may be counted toward fulfillment of the requirements of the minor. The Center for Russian and East European Studies awards a certificate in Russian Area Studies to students successfully completing all the requirements of the program.

The minor helps prepare students for further academic work in the Russian area at the graduate level or to pursue careers as area specialists in commerce, industry, journalism, education, and various governmental and international agencies.

REQUIREMENTS FOR THE MINOR: 21-33 credits

ADDITIONAL COURSES (15-27 credits)
RUS 001(4), RUS 002(4), RUS 003(4) or RUS 011(6), RUS 012(6) (Sem: 1-6)
Select 6-9 credits in humanities from HIST 142 GS(3), HIST 433(3), HIST 434(3), RUS 141W(3), or RUS 142W(3) (Sem: 1-8)
Select 6-9 credits in the social sciences from ECON 372 GS(3), GEOG 427(3), PL SC 413(3), PL SC 414(3), or PL SC 452(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits of RUS 200-level courses or above (Sem: 3-8)

RUSSIAN TRANSLATION MINOR

College of the Liberal Arts

The Russian Translation minor is designed to offer, within the context of a liberal education, specialized skills in technical translation from the Russian language. The curriculum is career-oriented and requires competence in a technical field or fields in addition to the language skill. The student will select such a field or fields in accordance with his or her special interests and in consultation both with an adviser and with persons directly involved with the field chosen.

The Department of Germanic and Slavic Languages and Literatures offers an array of courses in Russian language, literature, and culture. Study abroad in Russia at St. Petersburg University under the University's study abroad program is available. For the Russian Translation minor, students must take RUS 400, RUS 412, and an additional 12 credits of Russian, 3 at the 400 level and 9 at the 200 level or higher, for a total of 18 credits.

The Russian Translation minor opens employment opportunities for its graduates in fields and professions where proficiency in one or more foreign languages is desirable or required.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (6 credits)
RUS 400(3), RUS 412(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 9 credits of Russian courses at the 200 level or higher (Sem: 5-8)
Select 3 credits of 400-level Russian courses (Sem: 5-8)

SCIENCE, TECHNOLOGY, AND SOCIETY MINOR

College of Engineering

This interdisciplinary minor is designed for students in every curriculum at the University. The S T S courses help students integrate their other courses within the framework of the relationships of science, technology, and society. This minor enables students to examine critically the impact of scientific investigation and technological development on society's values, priorities, and institutions, and alternatively the influence human needs have upon scientific and technological activities. A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 21 credits

PRESCRIBED COURSE (3-6 credits)
S T S 496(3-6) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (15-18 credits)
Select 9-12 credits from S T S courses (at least 6 credits must be at the 400 level) (Sem: 1-8)

SOCIOLOGY MINOR

Abington College; Commonwealth College; College of the Liberal Arts

The sociology minor allows students to explore the wide range of topics, social groups, and social interactions studied by sociologists. From social inequalities and social problems to the familiar institutions of family, school, religion, and government, the diversity of courses available allows sociology minors to explore courses relevant to their interests. The courses also provide multiple viewpoints, studying the intimate interactions of families and small groups and the complex interactions of global economies and political alliances. Requiring a minimum of 18 credits in sociology, including Introductory Sociology (SOC 001) and two courses at the 400 level, students have flexibility in choosing a set of courses for their sociology minor.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (3 credits)
SOC 001 GS(3) (Sem: 1-6)

SUPPORTING COURSES AND RELATED AREAS (15 credits)
Select 15 credits in sociology; at least 6 of those credits must be at the 400 level (Sem: 1-8)

SPANISH MINOR

Altoona College; Berks-Lehigh Valley College: Penn State Berks; College of the Liberal Arts

A grade of C or better is required for all courses in the minor. Courses taught in English may not be counted toward the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (6 credits)
SPAN 200(3), SPAN 400(3) (Sem: 2-8)

ADDITIONAL COURSES (3 credits)
Select 3 credits from SPAN 210(3) or SPAN 220(3) (Sem: 3-6)

SUPPORTING COURSES AND RELATED AREAS (9 credits)
Select 6 credits of Spanish courses (Sem: 2-8)
Select 3 credits of 400-level Spanish courses (Sem: 5-8)
NOTE: Courses taught in English may not be counted toward the minor.

STATISTICS MINOR

Penn State Erie, The Behrend College

The minor in Statistics (STABD) provides students with a strong statistical background for careers in biology, actuarial science, engineering, mathematics; or for graduate studies in many fields. The minor is designed to make students proficient in the collection, interpretation and analysis of data.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 28-30 credits

PRESCRIBED COURSES (20 credits)
MATH 140 GQ(4), MATH 141 GQ(4) (Sem: 1-2)
STABD 303(3), STABD 404(3), STABD 443(3), STABD 444(3) (Sem: 3-8)

ADDITIONAL COURSES (2-4 credits)
Select 2-4 credits from MATH 230(4) or MATH 231(2) (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits of 400-level STABD or STAT or selected MTHBD courses (Sem: 5-8)

STATISTICS MINOR

Eberly College of Science

The Statistics minor introduces students to the quantitative aspects of research. Understanding statistics is useful for research in many areas including agriculture, business, education, social science and sciences as well as many jobs in industry and government.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 21 credits
PRESCRIBED COURSES (9 credits)
MATH 140 GQ(4), MATH 141 GQ(4) (Sem: 1-2)
STAT 480(1) (Sem: 5-8)

ADDITIONAL COURSES (12 credits)
Select 6 credits from STAT 318(3) and STAT 319(3) or STAT 414(3) and STAT 415(3) (Sem: 3-8)
Select 6 credits from STAT 416(3), STAT 460(3), STAT 462(3), or STAT 464(3) (Sem: 5-8)

SUPPLY CHAIN AND INFORMATION SCIENCES AND TECHNOLOGY MINOR

Eberly College of Science

The minor in SCIST is structured to provide students not majoring in Supply Chain & Information Systems (SC&IS) or Management Information Systems (M I S) with the opportunity to develop working knowledge of information technology, supply chain management, and their interdisciplinary synergies. The joint minor is designed for professional careers in business, information systems, software development, consulting, and government. The successful minor must, at a minimum, possess basic knowledge of quantitative techniques, computer applications, and microeconomics.

A one-time tuition surcharge will be applied to all students enrolled in the minor. A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (18 credits)
IST 110(4), IST 210(3), IST 220(3) (Sem 1-7)
B A 302(2)*.(Sem 5-6)
SC&IS 404(3), SC&IS 405(3) (Sem: 6-8)
*Admission to B A 302 will be controlled by the SC&IS Department for students enrolled in the SCIST Minor.

TECHNICAL WRITING MINOR

Commonwealth College; College of the Liberal Arts

The Department of English offers an 18-credit minor leading to a Technical Writing certificate to all students, regardless of major or college, who want to do concentrated work in technical writing. A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (3 credits)
ENGL 418(3) (Sem: 5-8)

ADDITIONAL COURSES (12-15 credits)
(Some courses in this category may have prerequisites that are not required in the minor.)
Select 3-6 credits from CAS 452(3), ENGL 470(3), ENGL 471(3), ENGL 472(3), ENGL 473(3), ENGL 474(3), S T S 407(3) (Sem: 3-8)
Select 6-9 credits from ENGL 415(3), ENGL 416(3), ENGL 417(3), ENGL 421(3), ENGL 495(3) (Sem: 3-8)
Select 3-6 credits from ART 270 GA(3), ART 271(3), INSYS 412(3), INSYS 413(3), INSYS 441(3), PSY 421(3), PSY 432(3) (Sem: 3-8)

SUPPORTING COURSES AND RELATED AREAS (0-3 credits)
(Some courses in this category may have prerequisites that are not required in the minor.)

TECHNOLOGY INTEGRATION MINOR FOR PRESERVICE TEACHERS

College of Education

This minor consists of a program of study designed to enable teacher education students to: (1) develop skills and competencies in the integration of technology into teaching, learning, and curricula; (2) develop further expertise in teaching and learning through use of technology as thinking tools; (3) identify and solve everyday teaching and learning problems through applications of technology; and (4) generate powerful innovations to potentially redefine teaching and learning practices.

This 21-credit minor may be combined with any teacher education major at Penn State. Only courses in which the student earns a grade of C or better may be counted toward the fulfillment of the requirements for the minor.

Students may apply for admission to this minor by completing and submitting an Application for Admission to a Minor to the Instructional Systems Program, 314 Keller Building, University Park campus, 16802. For more information, contact Dr. Susan Land, SML11@psu.edu, 310-D Keller Building, 814-863-5990.

REQUIREMENTS FOR THE MINOR: 21 credits

PRESCRIBED COURSES (9 credits)
EDPSY 014(3), INSYS 200(3) (Sem. 1-4)
INSYS 400(3) (Sem. 5-8)

ADDITIONAL COURSES (12 credits)
(Some courses in this category include prerequisites not required in the minor.)
Select 12 credits from INSYS 441(3), INSYS 446(3), INSYS 447(3), INSYS 448(3), INSYS 449(3), LL ED 480 DF(3), MTHED 427(3) (Sem. 5-8)

THEATRE MINOR

College of Arts and Architecture

The heatre minor is designed to be an enhancement to a major area of study and/or personal enrichment. The minor should be particularly attractive to students in the humanities (English), communication (Film, Journalism), and the arts (Music, Architecture). The minor may also be attractive to students who need to demonstrate a wide range of interests.

The theatre minor requirements total 18 hours. Theatre 100, a required course in the minor, is an experiential survey of all aspects of the living theatre, as presented by a resident company of theatre artists. Theatre 410, an advanced script analysis course, is also required. Students choose two courses from the approved list of theatre history courses. These supporting courses place the literature and aesthetic in historical, social, and political perspective. Students elect 6 theatre credits as additional courses. They typically schedule Theatre 102, acting for the non-major, and an introductory design or additional theatre history class.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (3 credits)
THEA 410(3) (Sem: 5-8)

ADDITIONAL COURSES (9 credits)
THEA 100 GA(3) or THEA 105 GA(3) (Sem: 1-2)
Select 6 credits from THEA 401W(3), THEA 402W(3), THEA 405(3), THEA 406 DF(3), THEA 408(3), THEA 412 GI(3), THEA 426(3), THEA 464(3), or THEA 465(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits of THEA courses (Sem: 3-8)

WATERSHEDS AND WATER RESOURCES MINOR

College of Earth and Mineral Sciences

Watersheds are important landscape features that control the biogeochemistry of natural waters. This interdisciplinary minor enables students to learn the fundamental processes governing the transport and chemical evolution of surface and subsurface waters. It provides a complement to elective and required course work in earth sciences, resource management, wastewater treatment, and/or environmental planning. Students in this program will learn to apply fundamental concepts of chemistry, biology, geoscience, and landscape evolution to processes operating at the watershed scale. Learning objectives for the minor include excellence in written and oral expression, the ability to collect and interpret data from dynamic natural systems, and rigor in scientific thought.

REQUIREMENTS FOR THE MINOR: 18 credits

ADDITIONAL COURSES (18 credits)
Select 18 credits from the WWR committee's approved list of courses, which includes but is not limited to courses listed below (at least 6 credits must be taken at the 400 level):
ASM 327(3), BIOL 435(3), CE 270(3), CE 475(3), CHEM 034(3), ERM 200(1), ERM 411(3), ERM 424(1), FOR 470(3), FOR 471(1), GEOEE 408(3), GEOG 410(3), GEOSC 201(4), GEOSC 340(3), GEOSC 412(3), GEOSC 413(3), GEOSC 452(3), GEOSC 457(3), GEOSC 462(3), GEOSC 483(3), METEO 417(3), SOILS 415(3), WFS 309(3), WFS 410(3) (Sem: 5-8)

WILDLIFE AND FISHERIES SCIENCE MINOR

College of Agricultural Sciences

The Wildlife and Fisheries Science minor provides non-majors with an introduction to the principles and practices of wildlife and fisheries conservation, research, and management. Although the minor includes both wildlife and fisheries course offerings, courses may be selected to provide a focus in one area or the other.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (6 credits)
W F S 209(3), W F S 430(3) (Sem: 5-6)

ADDITIONAL COURSES (12 credits)
Select 12 credits from W F S 300(2), W F S 407(3), W F S 408(3), W F S 410(3), W F S 422(3), W F S 440(3), W F S 450(3), W F S 447W(3), W F S 452(2), and W F S 463W(3) (Sem: 5-8)

WOMEN'S STUDIES MINOR

Altoona College; Commonwealth College; Penn State Erie, The Behrend College; College of the Liberal Arts

This interdisciplinary minor is designed to develop a broad understanding of the study of women and women's perspectives in all areas of academic scholarship. The primary focus is on feminist analyses of women's lives, women's social, cultural, and scientific contributions, and the structure of sex/gender systems. The interdisciplinary and inclusive nature of the field is reflected in a curriculum that includes courses cross-listed with a wide variety of departments, courses that deal with aspects of women's lives throughout history, and courses that recognize the diversities of culture, race, religion, ethnicity, age, disability, and sexual orientation. The Women's Studies minor emphasizes the development of critical and analytical skills, creative approaches to problem solving, and the ability to articulate productive alternatives.

Women's Studies minors have a definite career advantage, and can be successful in a wide variety of career paths. Some of these include legal advocacy, counseling, journalism, public relations, management, nonprofit administration, teaching, medicine, politics, or art. In addition, many alumnae/i are currently studying in professional, law, or graduate schools.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (3 credits)
WMNST 301(3) (Sem: 1-4)

ADDITIONAL COURSES (3 credits)
WMNST 001 GS;GI(3) or WMNST 003 GS;GI (Sem: 1-4)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 12 credits in Womens's Studies or from the program-approved list; at least 6 credits must be at the 400-level
—3 credits from each of the following categories: (Sem: 1-8)
a. arts or humanitites
b. natural or social sciences
c. focusing on non-Western women or on women of color in the United States

WOMEN'S STUDIES MINOR

Capital College

This interdisciplinary minor provides students with an opportunity to develop a broad understanding of women's perspectives and gender issues and to integrate that understanding into major areas of academic study. A total of 18 credits must be taken as part of the student's program; at least 9 of these credits must be taken at Penn State Harrisburg and 6 must be at the 400 level. Students must receive a grade of C or better in all courses in the minor.

A student seeking admission to the Women's Studies minor must first be admitted to a Division/School major at Penn State Harrisburg. A Program of Study must be completed in consultation with the student's major adviser and submitted to the Women's Studies Coordinating Committee, which will select a Women's Studies adviser for the student. Decisions regarding the appropriateness of courses for the minor will be made by the Women's Studies program. (The major adviser may also serve as adviser to the minor.)

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (6 credits)
WOMST 315 DF(3)[76] (Sem: 1-4)
WOMST 415 DF(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (12 credits)
Select 9 credits of Behavioral Sciences and Education, Humanities or Public Affairs. (Sem: 1-8)
Select 3 credits from approved department list of 400-level courses. (Sem: 5-8)
NOTE: [76] Students who have passed WMNST 001 GS;GI(3) or equivalent with a grade of C or better may, with the permission of the Women's Studies program, take another Women's Studies course on a more specialized topic instead of WOMST 315 DF(3).

WOOD PRODUCTS MARKETING MINOR

College of Agricultural Sciences

The Wood Products Marketing minor offers students in other majors, especially those oriented toward business, science, or engineering, an opportunity to develop a basic competency in wood products marketing and processing. Students will obtain knowledge and skills particularly helpful for those who wish to seek employment in sales, as a specifier of wood-based materials for construction and design, or in other related fields in the wood products industries.

A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (15 credits)
W P 411(4), W P 417(4), W P 435(3), W P 437W(4) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (3 credits)
Select 3 credits of W P courses (Sem: 3-8)

WORLD LITERATURE MINOR

College of the Liberal Arts

The minor in World Literature enables students to create a package of literature courses tailored to their interests. It offers an international approach to the study of literatures and cultures around the globe. A Senior Seminar is the culminating course. Education abroad can be included in this minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (3 credits)
CMLIT 400W(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (15 credits)
Select 15 credits in Comparative Literature (at least 3 of these credits at the 400 level), unified by topic, theme, period, or a similar principle, subject to approval of a faculty adviser (Sem:1-8)

WRITING MINOR

Capital College

Writing is valued as a mode of learning, as a means of expression, and as a skill highly desirable in the workplace. Personal development, interpersonal communication, and professional marketability may all be enhanced by the further study and practice of writing. For these reasons, the Writing minor offers students from virtually every discipline across the University an opportunity to learn more about a wide variety of writing: informative/persuasive, professional, and creative, while improving their own writing skills through hands-on writing experiences. In addition to offering students opportunities to study and practice different types of writing, the minor affords students the opportunity to write for/in different media, producing both print and electronic texts.

For the Writing minor, a total of 18 credits is required. Students may not count courses used to satisfy General Education Writing/Speaking Skills. A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES: 6 credits
ENGL 210(3) (Sem: 3-8)
ENGL 420(3) (Sem: 5-8)

ADDITIONAL COURSES: 6-12 credits
At least 3 credits of Additional/Supporting courses must be taken at the 400 level.
Select 6-12 credits from ENGL 212(3), ENGL 213(3), ENGL 215(3), ENGL 411(3), ENGL 412(3), ENGL 413(3), ENGL 414(3), ENGL 416(3), ENGL 417(3), ENGL 418(3), ENGL 419(3), ENGL 421(3), ENGL 422(3), ENGL 423(3), ENGL 425(3), ENGL 470(3), ENGL 471(3), ENGL 474(3) (Sem: 3-8)

SUPPORTING COURSES: 0-6 credits
Select 0-6 credits from a department approved list (Sem: 5-8)

YOUTH AND FAMILY EDUCATION MINOR

College of Agricultural Sciences

The Youth and Family Education minor is an interdisciplinary program of study designed to prepare students for work in the Penn State Cooperative Extension or other nonformal education programs.

The minor offers course work from several disciplines and addresses student needs in areas such as nonformal education methods, adult education, leadership, youth programs, and communication methods and media. A period of internship or field experience is required. To complete a bachelor's degree with a minor in Youth and Family Education, a student is required to complete 18 credits from a list of recommended courses. The core program consists of 15 credits. Students are expected to strengthen their expertise by taking at least 3 additional credits from the courses recommended. A grade of C or better is required for all courses in the minor.

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (15 credits)
AEE 450(3), YFE 455(3), YFE 495(6), R SOC 305W(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (3 credits)
ADTED 460(3), AEE 440(3), YFE 295(1-2), YFE 496(1-3), or YFE 497(1-9) (Course selection may be influenced by experience and educational background of the student. Individual programs are set jointly by the student and the program committee chair.) (Sem: 1-8)

COURSE DESCRIPTIONS

NOTE

The information in this section was current as of April 1, 2004. The college(s) offering the courses are listed under each course heading. For more current course description information, see the University Course Descriptions link in the Undergraduate Bulletin on the Web:
www.psu.edu/bulletins/bluebook

COURSE-NUMBERING SYSTEM

Course descriptions are arranged alphabetically. If any course cannot be located readily, refer to the index. *Multiple offerings may be accommodated by the use of suffixes A, B, etc.* Courses are numbered as follows:

UNDERGRADUATE COURSES (1 to 399): General courses accepted in fulfillment of requirements for the bachelor's degrees.

ADVANCED UNDERGRADUATE COURSES (400 to 499): Courses open to graduate students and to juniors and seniors and, with the special written permission of the head of the department or the chair of the program sponsoring the course, to qualified students in earlier semesters.

GRADUATE COURSES (500 to 599): Courses restricted to students registered in the Graduate School, seniors with an average of at least 3.50, and other students who have been granted permission to enroll by the dean of the Graduate School. These courses are described in the Penn State *Graduate Degree Programs Bulletin.*

MEDICAL COURSES (700 to 799) Courses restricted to students registered in the College of Medicine.

LAW COURSES (900 to 999) Courses restricted to students registered in The Dickinson School of Law.

COMMON COURSE NUMBERS

The following course numbers for which students may register have been set up for common use by major programs, with University Senate approval, to encourage innovation and provide flexibility in designing programs, but in no case may a course be scheduled for 0 credits. *Multiple offerings may be accommodated by the use of suffixes A, B, etc.*

097, 197, 297, 397, 497; 098, 198, 298, 398, 498. SPECIAL TOPICS (1–9) (Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.) Several different topics may be taught in one year or semester. A specific title may be used in each instance and will be entered on the student's transcript.

099, 199, 299, 399, 499. (GI) FOREIGN STUDIES (1–12) (Courses offered in foreign countries by individual or group instruction.) A specific title may be used in each instance and will be entered on the student's transcript.

187 FIRST-YEAR SEMINAR Listed under some liberal arts-related academic headings, this course has prerequisites of first-semester standing and enrollment in the College of the Liberal Arts.

294, 494. RESEARCH PROJECT COURSES (1–12) (Supervised student activities on research projects identified on an individual or small-group basis.) A specific title may be used in each instance and will be entered on the student's transcript.

295, 395, 495. INTERNSHIP (1–18) (Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.) A specific title may be used in each instance and will be entered on the student's transcript. *Prerequisite: prior approval of proposed assignment by instructor.*

296, 496. INDEPENDENT STUDIES (1–18) (Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.) A specific title may be used in each instance and will be entered on the student's transcript. *Students may not register for these courses without prior written approval of a faculty member in the department in which the courses are listed.*

GENERAL EDUCATION COURSE SUFFIXES

Courses that appear in this bulletin with the following suffixes have been approved for General Education:

Skills Courses
- Writing/Speaking—GWS
- Quantification—GQ

Knowledge Domain Courses
- Health and Physical Activity—GHA (formerly Health Sciences—GHS, and Physical Education—GPE)
- Natural Sciences—GN
- Arts—GA
- Humanities—GH
- Social and Behavioral Sciences—GS

SUFFIXES FOR ADDITIONAL REQUIREMENTS

In addition to the General Education degree requirements, every baccalaureate degree student will also complete the Intercultural and International Competence (GI), Writing Across the Curriculum (M, W, X, and Y), and First-Year Seminar (S, T, X, or PSU designation) requirements.

Courses that appear in this bulletin with an H, M, or T suffix following the course number are identified as honors courses. Schreyer Honors College students may participate in honors courses. In addition, any University Senate approved course may be offered with the honors suffix identification with the approval of the Schreyer Honors College. The honors identification will be entered on the student's transcript.

CREDITS AND HOURS

Credits are awarded on the semester-hour basis. According to Senate Policy 42-23, a total of at least forty hours of work planned and arranged by the University faculty is required for the average student to gain 1 credit. While the distribution of time varies from course to course, generally one-third of the time is devoted to formal instruction, such as lecture, recitation, laboratory, field trips, etc., and two-thirds of the time to outside preparation.

CREDITS, CLASSROOM WORK, AND PRACTICUM WORK

The number of credits for each course is indicated in parentheses and can be earned with classroom, practicum, or laboratory work as designated in the *Schedule of Courses,* accessible through the Registrar's home page at: http://www.psu.edu/registrar/ on the Web.

A typical period is fifty minutes.

A department may schedule an entire section in an undergraduate course for fewer credits than the maximum authorized. In 400-level courses, a department may schedule an individual student for fewer credits than the maximum authorized. In no case, however, may the course be scheduled for 0 credit, or may the total credits scheduled for any student exceed the maximum number authorized for the course.

COURSES THAT MAY BE REPEATED AND VARIABLE CREDIT COURSES

If a course may be repeated, the words "per semester" follow the number of credits—for example "3 credits per semester." These courses may be repeated indefinitely unless the credits are followed by the maximum number of credits allowed, such as "3 per semester, maximum of 12."

Courses may have variable credits, such as 1–3, 2–6, or 3–10. Here, the larger number signifies the total credits that can be accumulated for the course over an indefinite number of semesters, unless otherwise specified. For example, a course listed with 1–6 could be taken six semesters for 1 credit each semester, or two semesters for 3 credits each semester, or once for 6 credits, etc.

In some courses with variable credits, students may be permitted to accumulate more than the larger number shown. Such courses will be listed as, for example, "1–3 per semester, maximum of 12."

Any special departmental limitations are indicated by footnotes.

PREREQUISITE AND CONCURRENT COURSES

Prerequisites are approximations of the necessary prior specific or general academic knowledge, background, or semester standing required in order to succeed academically in a specific course. Concurrent courses are to be taken in the same semester. The course instructor has the right to limit the students in the course to those who have the stated prerequisites. If this limitation is exercised, it must occur before the end of the course add period.

Any student who wishes to take a course for which he/she does not have the listed prerequisite or concurrent course must consult with his/her adviser and obtain the permission of the instructor or course coordinator (if any) of the course for which an exception is desired. The instructor or course coordinator may waive the requirement if convinced that the student has acquired the necessary prerequisite knowledge from other sources.

COURSE DESCRIPTIONS

ACCOUNTING (ACCT)

Capital College

ACCT 300 ACCOUNTING INFORMATION SYSTEMS (3 credits per semester) An examination of accounting information systems and their related controls for improving decision making and performance evaluation. Prerequisite: ACCTG 211

ACCT 310 PRINCIPLES OF TAXATION (3) Study of income determination concepts for individuals and corporations, impact of taxation on decisions, elementary research techniques, and ethical standards. Prerequisite: ACCTG 211

ACCT 340 COST ACCOUNTING (3) Accounting for manufacturing concerns; actual and standard cost systems, and managerial uses of cost data. Prerequisite: ACCT 301

ACCT 397 SPECIAL TOPICS (1–9)

ACCT 400 INTERMEDIATE ACCOUNTING I (3) Financial accounting theory emphasizing generally accepted accounting principles, the accounting model, asset valuations and cost allocations for information and reporting. Prerequisite: ACCT 301

ACCT 401 INTERMEDIATE ACCOUNTING II (3) Corporate accounting, emphasizing bonds, stock-rights and options, long-term investments, leases, pension costs, price level accounting and value concepts. Prerequisite: ACCT 400
ACCT 410 ADVANCED TAXATION (3) An examination of the rules and forms used to compute the federal tax liability of corporations and partners. Prerequisite: ACCT 301, ACCT 310
ACCT 420 ADVANCED ACCOUNTING (3) Advanced accounting problems involved in partnerships and corporations particularly involving business combinations, special sales procedures, and fiduciary accounting. Prerequisite: ACCT 400
ACCT 430 AUDITING (3) Principles and procedures of an independent examination of financial statements and the ethical and legal responsibilities of the accounting profession. Prerequisite: ACCT 400
ACCT 431 ADVANCED AUDITING (3) Examination of legal liability, EDP, statistical sampling, SEC reporting, internal control, and financial reporting in specialized industries. Prerequisite: ACCT 430
ACCT 435 ACCOUNTING INFORMATION SYSTEMS II (3) An analysis of computer systems and controls to improve economy, efficiency, and effectiveness of performance. Prerequisite: ACCT 301, INFSY 390
ACCT 440 ADVANCED MANAGEMENT ACCOUNTING (3) Management accounting topics such as decision models, quantitative techniques, variance analysis, and their use in accounting. Prerequisite: ACCT 301, ACCT 340
ACCT 450 GOVERNMENTAL AND NOT-FOR-PROFIT ACCOUNTING (3) Provides an understanding of governmental and not-for-profit accounting theory, procedures, and financial statements. Prerequisite: ACCT 301
ACCT 460 ACCOUNTING THEORY (3) An analysis of the development of accounting theory and its current and future impact on accounting. Prerequisite: ACCT 400
ACCT 470 INTERNATIONAL ACCOUNTING (3) Study of international accounting issues with emphasis on need, use and interpretation of financial accounting required in global business environment. Prerequisite: ACCTG 211
ACCT 489 SEMINAR IN ACCOUNTING (3) New trends and concepts in accounting; applications and impact on problem solving and decision making. Prerequisite: permission of program
ACCT 494 RESEARCH PROJECT (1–12)
ACCT 495 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
ACCT 496 INDEPENDENT STUDIES (1–18)
ACCT 497 SPECIAL TOPICS (1–9)

ACCOUNTING (ACCTG)

Smeal College of Business

ACCTG 151 INTRODUCTORY FINANCIAL ACCOUNTING I (3) Basic concepts, principles, and practices for the recording, summarizing, and interpreting of accounting data.
ACCTG 152 INTRODUCTORY FINANCIAL ACCOUNTING II (3) Accounting for partnerships, corporations, cash flows, certain liabilities and assets, and the analysis of financial statements. Prerequisite: ACCTG 151
ACCTG 153 INTERMEDIATE ACCOUNTING (3) Financial accounting statements, concepts, and procedures; assets, liabilities, owners' equity, statement analysis. Students may not receive credit for both ACCTG 150 and 471. Prerequisite: ACCTG 151, ACCTG 152
ACCTG 160 COST ACCOUNTING (3) Use of standard cost accounting procedures to present cost and budget statements as a means of providing managerial control. Students may not receive credit for both ACCTG 160 and ACCTG 404. Prerequisite: ACCTG 211
ACCTG 170 NOT FOR PROFIT ACCOUNTING (3) Accounting procedures designed to meet the environmental characteristics of nonprofit and governmental entities. Prerequisite: ACCTG 211
ACCTG 186 FEDERAL TAX ACCOUNTING (3) Tax planning and compliance with federal income tax rules and regulations, especially those affecting individuals.
ACCTG 201 INTRODUCTORY FINANCIAL ACCOUNTING (3) Fundamentals of the collection, recording summarization, and interpretation of accounting data.
ACCTG 202 INTRODUCTORY MANAGERIAL ACCOUNTING (3) Actual and standard cost system, managerial use of cost, data, budgeting and performance evaluation. Prerequisite: ACCTG 201
ACCTG 211 FINANCIAL AND MANAGERIAL ACCOUNTING FOR DECISION MAKING (4) Introduction to the role of accounting numbers in the process of managing a business and in investor decision making.
ACCTG 296, 496 INDEPENDENT STUDIES (1–18)
ACCTG 297, 397, 497 SPECIAL TOPICS (1–9)
ACCTG 300H HONORS COURSE IN ACCOUNTING (1–12) Honors program of intensive individual or group study in various areas of accounting. Prerequisite: fifth-semester standing, approval by Departmental Honors Committee
ACCTG 306 PRINCIPLES OF TAXATION (4) Elements of tax policy and tax-planning concepts for personal and business decision making; with emphasis on taxation of individuals. Prerequisite: ACCTG 211, B A 301, B A 304
ACCTG 311 ACCOUNTING SYSTEMS AND CONTROL (3) Introduction to accounting procedures to gather,

to aggregate, and to report accounting data to managers and to external readers. Prerequisite: ACCTG 211
ACCTG 398 SPECIAL TOPICS (1–9)
ACCTG 403W AUDITING (4) Financial, compliance, internal, and operational audits; standards and procedures; sampling; EDP auditing; professional issues; application of concepts through written responses. Prerequisite: or concurrent: ACCTG 472, CMPSC 203
ACCTG 404 MANAGERIAL ACCOUNTING (4) Accounting techniques as planning, control, and motivating devices in business and other organizations; accounting data for decision making and performance evaluation. Prerequisite: ACCTG 311, CMPSC 203
ACCTG 406 ADVANCED FEDERAL TAXATION (3) Impact of federal tax structure on business decisions, research methodology, tax planning; ethical considerations of tax practice. Prerequisite: ACCTG 160 or ACCTG 211; ACCTG 306
ACCTG 413 AUDITING INTERNSHIP (3) Full-time auditing experience for at least 10 weeks with approved firms. Students who have passed ACCTG 414 may not schedule this course. Prerequisite: ACCTG 403W
ACCTG 414 MANAGERIAL ACCOUNTING INTERNSHIP (3) Full-time accounting experience for at least ten weeks with approved firms. Students who have passed ACCTG 413 may not schedule this course. Prerequisite: ACCTG 403W or ACCTG 404
ACCTG 421 (I B) INTERNATIONAL ACCOUNTING (3) Unique financial and managerial accounting problems facing multinational corporations; accounting systems in different economic environments. Prerequisite: ACCTG 471
ACCTG 432 ACCOUNTING INFORMATION SYSTEMS (4) Systems analysis tools and techniques; internal control concepts; development of computer control procedures. Prerequisite: M I S 204
ACCTG 433 COMPUTER AUDIT AND CONTROL (4) Management application controls for EDP systems; EDP audit techniques; evaluation of system reliability. Prerequisite: or concurrent: ACCTG 403W
ACCTG 471 INTERMEDIATE FINANCIAL ACCOUNTING I (3) Theory and practice issues in income concepts and value measurement; GAAP; revenues, costs, assets, liabilities, and equities. Students may not receive credit for both ACCTG 150 and 471. Prerequisite: ACCTG 311, CMPSC 203
ACCTG 472 INTERMEDIATE FINANCIAL ACCOUNTING II (3) Off-balance-sheet financing; special issues in cost capitalization, liabilities, and equities; matching; funds flow statements; statement analysis; inflation accounting. Prerequisite: ACCTG 471
ACCTG 473 ADVANCED FINANCIAL ACCOUNTING (4) Reporting for multi-corporate enterprises, business combinations, quasi- reorganizations, and selected contemporary reporting problems. Prerequisite: or concurrent: ACCTG 472

ACCOUNTING (ACNTG)

Penn State Erie, The Behrend College

ACNTG 197, 297, 397, 497 SPECIAL TOPICS (1–9)
ACNTG 294, 494 RESEARCH PROJECT (1–12)
ACNTG 296, 496 INDEPENDENT STUDIES (1–18)
ACNTG 305 FINANCIAL STATEMENTS AND MANAGEMENT DECISIONS (4) Impact of management's financing, investing, and operating decisions on GAAP- based financial statements. Students who have passed ACNTG 310 or 311 may not take this course for credit. Prerequisite: ACCTG 211, FNC 300
ACNTG 310 INTERMEDIATE ACCOUNTING I (4) Financial accounting methods, theory and concepts; analysis of problems in applying concepts to financial statements and asset accounts. Prerequisite: ACCTG 211
ACNTG 311 INTERMEDIATE ACCOUNTING II (3) Financial accounting theory and concepts; analysis of asset, liability, and owner's equity accounts; special problems involving pensions, leases, income tax allocation. Prerequisite: ACNTG 310
ACNTG 320 FEDERAL INCOME TAXATION (3) Tax regulations applicable to individuals and business enterprises, with emphasis on tax determination and planning. Prerequisite: ACCTG 211
ACNTG 340 COMMERCIAL LAW (3) Contracts, bailments, shipments, and sale of goods; financing transactions and creditors' rights; commercial paper; agency and business organization. Prerequisite: FIFTH-SEMESTER STANDING
ACNTG 410 ADVANCED ACCOUNTING (3) Accounting theory and practice for business combinations, branches, international operations, partnerships, consolidated financial statements, corporate liquidations, non-profit organizations, estates, and trusts. Prerequisite: ACNTG 311
ACNTG 412 COST ACCOUNTING (3) Cost systems, with emphasis on informtion generation for managerial planning and control. Prerequisite: ACCTG 211
ACNTG 413 ADVANCED MANAGEMENT ACCOUNTING (3) Introduces new ways of doing business, to control cost and cost management programs; case studies of cost accounting system changes. Prerequisite: ACNTG 412
ACNTG 420 ADVANCED FEDERAL INCOME TAX (3) An introduction to the taxation of corporations, partnerships, estates, and trusts. Prerequisite: ACNTG 320
ACNTG 421 ACCOUNTING PRACTICUM: VITA (3) Introduces students to practical aspects of tax preparation through the IRS' VITA program and completion of a tax research project. Prerequisite: ACNTG 320
ACNTG 422 ACCOUNTING SYSTEMS (3) Understanding how computerized and manual accounting systems work in organizations; how computers can be used in accounting context. Prerequisite: ACNTG 310

ACNTG 423 AUDITING PRACTICE AND STANDARDS (3) General overview of auditing, including the audit environment, review, test, and evaluation of internal control; substantive tests; and audit reports. Prerequisite: ACNTG 422
ACNTG 426 FINANCIAL STATEMENT ANALYSIS (3) The study of the basic financial statements under generally accepted accounting principles and the impact of accounting method choices. Prerequisite: ACNTG 310
ACNTG 495 INTERNSHIP (1–18)

ACOUSTICS (ACS)

Interdisciplinary
ACS 097, 497 SPECIAL TOPICS (1–9)
ACS 401 GENERAL ACOUSTICS (3) Basic principles of acoustics; perception of sound; electroacoustic transducers and fundamentals of sound techniques. Offered for Communications Disorders and some nonscience majors. Prerequisite: 3 credits of Communication Disorders
ACS 402 INTRODUCTION TO ACOUSTICS (3) Basic principles of acoustics and perception of sound; fundamentals of applications: electroacoustic transducers, noise measurement and control, architectural and building acoustics, underwater sound. Offered for science and engineering majors. Prerequisite: PHYS 203
ACS 403 MODERN ELECTRONICS FOR ENGINEERING ACOUSTIC APPLICATIONS (3) A wide-ranging coverage of modern electronic technology and the application of this technical base to acoustics and acoustical problems. Prerequisite: PHYS 202
ACS 496 INDEPENDENT STUDIES (1–18)
ACS 498 SPECIAL TOPICS (1–9)

ADMINISTRATION OF JUSTICE (ADM J)

College of the Liberal Arts
ADM J 012 (GS) (CLJ;SOC) CRIMINOLOGY (3) Explanations and measurement of crime; criminal law; characteristics of criminals and victims; violent, property, white-collar, organized, and sexual crimes.
ADM J 013 (GS) (SOC) JUVENILE DELINQUENCY (3) Juvenile conduct, causes of delinquency, current methods of treatment; organization and function of agencies concerned with delinquency.
ADM J 083S (GS) FIRST-YEAR SEMINAR IN ADMINISTRATION OF JUSTICE (3) Critical approaches to issues in criminal justice and criminology.
ADM J 111 (CLJ) INTRODUCTION TO THE AMERICAN CRIMINAL JUSTICE SYSTEM (3) Studies the formulation of laws, extent of crime, impact of victim and processing and sanctioning of offenders.
ADM J 113 (CLJ) INTRODUCTION TO LAW (3) Introduction to law in society with a focus on criminal law, judicial code, laws of sentencing and corrections, criminal procedure.
ADM J 197, 297, 497 SPECIAL TOPICS (1–9)
ADM J 200 INTRODUCTION TO SECURITY AND LOSS CONTROL (3) A general introduction to the field of private security and asset protection.
ADM J 201 LEGAL AND ETHICAL ISSUES IN PRIVATE SECURITY (3) Detailed examination of legal issues and ethical considerations in private sector security. Prerequisite: ADM J 200
ADM J 221 ISSUES IN THE AMERICAN CRIMINAL JUSTICE SYSTEM (3) Examination of the models of the criminal process, functions of the justice system, and approaches to crime and punishment. Prerequisite: ADM J 111
ADM J 230 CORRECTIONAL INSTITUTIONS AND SERVICES (3) Intensive analysis of intramural and extramural programs for juvenile and adult offenders; professional functions in the total correctional process. Prerequisite: SOC 012
ADM J 240W FIELD RESEARCH IN THE ADMINISTRATION OF JUSTICE (4) Field research and observational strategies appropriate to the identification, investigation, and analysis of research questions in the administration of justice. Prerequisite: ADM J 111
ADM J 245 CRIMINAL JUSTICE AND THE COMMUNITY (3) Justice agencies and the community's crime prevention and participation strategies; community involvement in policy development. Prerequisite: ADM J 111 or ADM J 221
ADM J 270 LAW OF CRIMES AND CORRECTIONS (3) Origin and function of law, legal reasoning, civil and criminal law concepts, the crimes code, specific crimes. Prerequisite: ADM J 111, PL SC 001, or PL SC 003
ADM J 285 POLICING IN AMERICA (3) This course will focus on the current status of law enforcement in the United States. Prerequisite: ADM J 111
ADM J 294, 494 RESEARCH PROJECT (1–12)
ADM J 296, 496 INDEPENDENT STUDIES (1–18)
ADM J 300H HONORS SEMINAR: ISSUES AND TRENDS IN THE ADMINISTRATION OF JUSTICE (3–6) Discussion of various, specific administration of justice topics, such as discretionary decision-making, due process, equal protection, violence, and recidivism. For CLJ majors. Prerequisite: fifth-semester standing, and admission to Schreyers Honors College
ADM J 301H HONORS SEMINAR: IDEOLOGY AND THE ADMINISTRATION OF JUSTICE (3–6) Discussion of the ideological, political, and historical nature of administration of justice. Punishment, deter-

rence, social control, incarceration will be examined. For CLJ majors. Prerequisite: fifth-semester standing, and admission to Schreyers Honors College

ADM J 302H HONORS THESIS (4–8) Research paper in an area of Administration of Justice arranged with the Honors Committee. Prerequisite: ADM J 300H, ADM J 301H

ADM J 310 FORENSIC SCIENCE I (3) Presentation of the techniques, skills, and limitations of modern crime laboratory. Prerequisite: CHEM 001 OR CHEM 002

ADM J 311 FORENSIC SCIENCE II (3) Continuation of ADM J 310 including statistical analysis of data from crime scene. Prerequisite: ADM J 310

ADM J 340 FUNDAMENTAL TECHNIQUES OF SCIENTIFIC CRIMINAL INVESTIGATION (3) Traditional and innovative technical approaches utilized by law enforcement scientists; capabilities and limitations of technical techniques highlighted.

ADM J 394 INTRODUCTION TO FIELD WORK IN ADMINISTRATION OF JUSTICE (1) Planning and preparation for field experience in an administration of justice agency setting. Prerequisite: ADM J 240W

ADM J 395 (CLJ) INTERNSHIP IN CRIMINAL JUSTICE (1–9 per semester) Field experience focusing on the student's major interest within the area of criminal justice. Prerequisite: ADM J 240W

ADM J 401 PROBATION, PAROLE, AND PARDONS (3) Examination of community treatment in the correctional process; contemporary usage of presentence investigation, selection, supervision, release of probationers and parolees.

ADM J 406 (SOC;CLJ) SOCIOLOGY OF DEVIANCE (3) Theory and research concerning behaviors and lifestyles viewed as significant departures from a group's normative expectations. Prerequisite: SOC 005, SOC 012, OR SOC 013

ADM J 410 CORRECTIONAL COUNSELING PROCESSES (3) Basic concepts and principles of counseling, interviewing, individual and group therapy, carried on in correctional field and institutional services. Prerequisite: HD FS 239, HD FS 445

ADM J 412 (SOC) CRIME, SOCIAL CONTROL, AND THE LEGAL SYSTEM (3) Legal and extralegal control; public opinion on crime; criminal justice and correctional processes; legal sanctions; control strategies. Field trip. Prerequisite: ADM J 012, ADM J 013, OR SOC 005

ADM J 414 (SOC) CRIMINAL CAREERS AND THE ORGANIZATION OF CRIME (3) Research on and theory of criminal careers and crime organizations, emphasizing recruitment and disengagement; offender characteristics and lifestyles; policy implications. Prerequisite: ADM J 012, ADM J 013, OR SOC 005

ADM J 420 SPECIAL OFFENDER TYPES (3–6) Study of special offender types; relationships with criminal justice system (drug abuse, organized crime, white collar crime considered different semesters). Prerequisite: 3 credits in Administration of Justice

ADM J 421 VIOLENT CRIME IN THE UNITED STATES (3) The impact of violent crime on victims, their families, and communities; the police process as it relates to violent crime. Prerequisite: ADM J 012

ADM J 421W VIOLENT CRIME IN THE UNITED STATES (3) The impact of violent crime on victims, their families, and communities; the police process as it relates to violent crime. Prerequisite: ADM J 012

ADM J 422 (CLJ) VICTIMIZATION (3) Examines the history, how victimization is measured/studied in social sciences, public policy implications of victimization movement in U.S. Prerequisite: ADM J 240W

ADM J 423 (GI) (WMNST) SEXUAL AND DOMESTIC VIOLENCE (3) Legal, sociological, and psychological perspectives on sexual and domestic violence. Prerequisite: ADM J 111 OR WMNST 001

ADM J 424 (CLJ) DRUGS AND CRIME (3) Analysis of international narcotics trafficking in the twentieth century. Prerequisite: ADM J 111, ADM J 240W

ADM J 424W DRUGS AND CRIME (3) Analysis of international narcotics trafficking in the twentieth century. Prerequisite: ADM J 111, ADM J 240W

ADM J 425 (CLJ) ORGANIZED CRIME (3) This course examines organized crime in terms of historical antecedents, structure, related theories, and policy issues. Prerequisite: ADM J 240W

ADM J 426 (HIST;J ST) JEWISH/AMERICAN ORGANIZED CRIME IN NEW YORK CITY (3) History of Jewish/American organized crime in New York City from 1890 through the Great Depression.

ADM J 430 CORRECTIONAL INSTITUTIONS AND SERVICES (3) Intensive analysis of intramural and extramural programs for juvenile and adult offenders; professional functions in the total correctional process. Prerequisite: SOC 012

ADM J 433 COMPUTER SECURITY (3) Introduction to computer security for Administration of Justice majors, designed to create an educated user of computer security services. Prerequisite: IST 110 or both M I S 103 and M I S 204

ADM J 439 (PL SC) THE POLITICS OF TERRORISM (3) Analysis of political terrorism as a violent alternative for peaceful change and traditional warfare in the nuclear age. Prerequisite: ADM J 111 OR PL SC 014

ADM J 441 THE JUVENILE JUSTICE SYSTEM (3) Historical and contemporary view of the juvenile justice system. Focus on analyzing components of the system, their interactions, processing, and handling of youths. Prerequisite: COM S 241 or HD FS 239 or SOC 013

ADM J 441W THE JUVENILE JUSTICE SYSTEM (3) Historical and contemporary view of the juvenile justice system. Focus on analyzing components of the system, their interactions, processing, and handling of youths. Prerequisite: HD FS 239 or SOC 013

ADM J 445 (COM S) CRIMINAL JUSTICE AND THE COMMUNITY (3) Justice agencies and the community's crime prevention and participation strategies; community involvement in policy development. Prerequisite: ADM J 111 or ADM J 221

ADM J 451 (GI) (CLJ) RACE, CRIME, AND JUSTICE (3) This course focuses on the significance of race, class, and ethnicity to criminal justice processing and criminal offending. Prerequisite: ADM J 111, ADM J 240W

ADM J 453 (GI) (WMNST) WOMEN AND THE CRIMINAL JUSTICE SYSTEM (3) This course focuses on the experiences of women as offenders, victims, and professionals in the criminal justice system. Prerequisite: ADM J 111 OR WMNST 001

ADM J 460 HISTORY AND FUNCTION OF CRIMINAL JUSTICE COMPONENTS (3) Historical development of criminal justice system components (police, courts, corrections) related to formulation and function of the state.

ADM J 462 COMPARATIVE CRIMINAL JUSTICE SYSTEMS (3) A comparison of American and selected foreign justice systems to illustrate the variety of possible responses to crime. Prerequisite: ADM J 111 or ADM J 221

ADM J 467 (SOC;CLJ) LAW AND SOCIETY (3) Law and society studies the social origins of law and legal systems; occupational careers, and decision-making of legal officials. Prerequisite: ADM J 113, ADM J 240W

ADM J 469 (HIST) DRUGS AND DRUG POLICY IN THE UNITED STATES (3) Examines the history and dimensions of drug use and analyzes the impact of drug policy. Prerequisite: 3 credits in: ADM J 012, or ADM J 111, or HIST 021

ADM J 470 LAW OF CRIMES AND CORRECTIONS (3) Origin and function of law, legal reasoning, civil and criminal law concepts, the crimes code, specific crimes. Prerequisite: ADM J 111, PL SC 001, or PL SC 003

ADM J 471 (B LAW) LEGAL RIGHTS, DUTIES, LIABILITIES OF CRIMINAL JUSTICE PERSONNEL (3) Civil law issues within a justice agency and between criminal justice agencies and members of the public. Prerequisite: ADM J 111 or B LAW 243

ADM J 472 CRIME AND THE AMERICAN COURT SYSTEM (3) An overview of the American criminal court system. Topics include court structure and personnel, processing of offenders, and sentencing practices. Prerequisite: ADM J 111

ADM J 473 (B LAW) CRIMINAL PROCEDURE AND EVIDENCE IN THE BUSINESS COMMUNITY (3) Law of evidence and proof, constitutional constraints on police procedures (arrest, search, etc.) in society and the business community. Prerequisite: ADM J 111 or B A 243

ADM J 482 (CLJ) SEMINAR, CRIMINAL JUSTICE AGENCY ADMINISTRATION (3) Relates organizational and public policy management approaches to police, courts, and correctional institutions. Prerequisite: ADM J 111

ADM J 485 POLICING IN AMERICA (3) This course will focus on the current status of law enforcement in the United States. Prerequisite: ADM J 111

ADM J 495A INTERNSHIP (1–18) Senior field experience focusing on the student's major interest in the area of administration of justice. Prerequisite: ADM J 240W

ADM J 499A (GI) EUROPEAN CRIMINAL JUSTICE (6) Examination of selected criminal justice systems while living within the culture and observing operations of various justice agencies. Prerequisite: ADM J 111

ADM J 499B (GI) FIELD RESEARCH IN EUROPE (3) Application of field research methods to individual research projects focusing on comparative criminal justice issues in the United States and Europe. Prerequisite: ADM J 240

ADULT EDUCATION (ADTED)

College of Education

ADTED 100 ADULT LEARNERS IN THE UNIVERSITY (3) Opportunity to develop effective learning strategies while exploring critical issues related to adults entering or returning to higher education.

ADTED 100S ADULT LEARNERS IN THE UNIVERSITY (1) Opportunity to develop effective learning strategies while exploring critical issues related to adults entering or returning to higher education.

ADTED 297 SPECIAL TOPICS (1–9)

ADTED 460 INTRODUCTION TO ADULT EDUCATION (3) History, methods, agencies, program areas, and problems of adult education in the United States.

ADTED 470 (CI ED) INTRODUCTION TO DISTANCE EDUCATION (3) An introduction to the history, philosophy, organizations, learning theories, and instructional procedures used in American and foreign distance education. ADTED 496 INDEPENDENT STUDIES (1–18)

ADTED 497, 498 SPECIAL TOPICS (1–9)

AEROSPACE ENGINEERING (AERSP)

College of Engineering

AERSP 001S AEROSPACE EXPLORER—FIRST-YEAR SEMINAR (1) First-Year Seminar explores aerodynamics, structural mechanics, flight mechanics, rotorcraft systems, high performance computers, air/space propulsion, and space systems.

AERSP 055 (GN) (S T S) SPACE SCIENCE AND TECHNOLOGY (3) The science and technology of space exploration and exploitation; physical principles; research and development; history, space policy, and social implications.

AERSP 097 SPECIAL TOPICS (1–9)

AERSP 200 PRINCIPLES OF AVIATION (3) Aviation history, piloting, principles of flight, navigation, meteorology,FAA regulations, the air transportation system. Prerequisite: third-semester standing

AERSP 204H FLIGHT VEHICLE DESIGN AND FABRICATION I (2 per semester, maximum of 8) Integrated project management, design, fabrication, testing, and flight evaluation of an advanced composite flight vehicle.

AERSP 301 AEROSPACE STRUCTURES I (3) Analysis of thin-walled beams subjected to combined loads, including bending, torsion, and shear; elastic stability; work and energy principles. Prerequisite: E MCH 013. Prerequisite or concurrent: AERSP 313

AERSP 302 AEROSPACE STRUCTURES II (3) Design and analysis of aerospace structures. Mechanics of advanced materials; advanced design concepts; numerical methods; structural dynamics. Prerequisite: AERSP 301. Prerequisite or concurrent: AERSP 304, E MCH 215

AERSP 304 DYNAMICS AND CONTROL OF AEROSPACE SYSTEMS (3) Vibrations of single, multiple, and infinite degree-of-freedom systems; operational methods applied to aerospace vehicles; design of controllers. Prerequisite: AERSP 313, E MCH 012

AERSP 306 AERONAUTICS (3) Lift and drag characteristics of aircraft; propulsion systems; airplane performance; introduction to stability and control. Prerequisite: AERSP 311, AERSP 313

AERSP 308 MECHANICS OF FLUIDS (3) Kinetics and dynamics of fluids; perfect fluid theory using complex variables; introduction to viscous flow theory; fundamentals of compressible flow. Prerequisite: E MCH 012 or E MCH 112H; MATH 251

AERSP 309 ASTRONAUTICS (3) Introduction to space and space flight; laws of particle mechanics; orbits and trajectories; space vehicles and propulsion. Prerequisite: E MCH 012, MATH 251; CMPSC 201C or CMPSC 201F

AERSP 311 AERODYNAMICS I (4) Fluid statics and kinematics; fluid mechanics of inviscid and viscous flows. Prerequisite: E MCH 012, MATH 251; CMPSC 201C or CMPSC 201F

AERSP 312 AERODYNAMICS II (4) Fluid mechanics of viscous and compressible flows, laminar boundary layers, turbulent flows, isentropic flows, shock waves, supersonic life and drag. Prerequisite: AERSP 311, AERSP 313, M E 030

AERSP 313 AEROSPACE ANALYSIS (3) Mathematical methods applied to aerospace engineering: Fourier series, ordinary and partial differential equations, complex variables, numerical methods. Prerequisite: MATH 220, MATH 230, MATH 251; CMPSC 201C or CMPSC 201F

AERSP 401A SPACECRAFT DESIGN—PRELIMINARY (2) Formulation of conceptual and preliminary design to satisfy a given set of specifications for a spacecraft. Prerequisite: AERSP 309. Prerequisite or concurrent: AERSP 450

AERSP 401B SPACECRAFT DESIGN—DETAILED (2) Design of primary and secondary structural components and other details of a spacecraft. Prerequisite: AERSP 302, AERSP 401A

AERSP 402A AIRCRAFT DESIGN—PRELIMINARY (2) Formulation of conceptual and preliminary design to satisfy a given set of specifications for an aircraft. Prerequisite: AERSP 306. Prerequisite or concurrent: AERSP 413

AERSP 402B AIRCRAFT DESIGN—DETAILED (2) Design of primary and secondary structural components and other details of an aircraft. Prerequisite: AERSP 302, AERSP 402A

AERSP 403 DESIGN OF AIR TRANSPORT SYSTEMS (3) Air transportation; vehicle technology; vehicle-airport-route design interface; ATC, energy, environmental, human, and regulatory considerations in design. Prerequisite: AERSP 306

AERSP 404H FLIGHT VEHICLE DESIGN AND FABRICATION II (3 per semester, maximum of12) Project management, design, fabrication, aerodynamic and structural testing, and flight evaluation of an advanced composite flight vehicle. Prerequisite: AERSP 204H

AERSP 405W AERODYNAMICS LABORATORY (2) Experiments in fluid mechanics, measurement systems, subsonic wind tunnel testing, supersonic wind tunnel testing. Prerequisite: AERSP 312. Prerequisite or concurrent: ENGL 202C

AERSP 406W STRUCTURES AND DYNAMICS LABORATORY (2) Experiments in static deformations and stresses, vibrations, and control of aerospace structures. Prerequisite: OR CONCURRENT: AERSP 302, ENGL 202C

AERSP 407 AERODYNAMICS OF V/STOL AIRCRAFT (3) Rotary wing aircraft; VTOL and STOL performance; propeller-wing combinations; jet flap; high lift devices. Prerequisite: AERSP 312

AERSP 410 AEROSPACE PROPULSION (3) Analysis and performance characteristics of reciprocating engine, turbo-jet, turbo-prop, turbo-fan, ram-jets, and chemical rockets. Aerothermodynamics of inlets, combustors, and turbomachinery. Prerequisite: AERSP 312

AERSP 411 AEROELASTICITY (3) Structural deformations under static and dynamic loads; static aeroelastic phenomena; unsteady two-dimensional incompressible and compressible flow; flutter. Prerequisite: AERSP 302, AERSP 312

AERSP 412 TURBULENT FLOW (3) Homogeneous turbulence; spectral transfer of energy, viscous dissipation; turbulent shear flow: mixing-length theory, eddy viscosity, scaling laws, energy budget. Prerequisite: one course in fluid mechanics

AERSP 413 STABILITY AND CONTROL OF AIRCRAFT (3) Static and dynamic stability and control of aircraft; open and closed loop systems. Prerequisite: AERSP 304, AERSP 306

AERSP 420 PRINCIPLES OF FLIGHT TESTING (3) In-flight and analytical studies of airplane performance, stability, and control; reduction of data; instrumentation; flight test techniques. Prerequisite: AERSP 306

AERSP 423 INTRODUCTION TO NUMERICAL METHODS IN FLUID DYNAMICS (3) Finite difference methods applied to solving viscid/inviscid fluid dynamics problems, error control, numerical stability. Prerequisite: AERSP 312 or M E 033; MATH 250 or MATH 251; CMPSC 201C or CMPSC 201F
AERSP 424 INTRODUCTION TO NUMERICAL METHODS ON PARALLEL COMPUTERS (3) This course discusses how to solve a variety of engineering and scientific problems on parallel computers. Prerequisite: CMPSC 201C or CMPSC 201F; MATH 220; MATH 250 or MATH 251
AERSP 425 THEORY OF FLIGHT (3) Advanced wing and airfoil theory, conformal mapping, slender body theory. Prerequisite: AERSP 306
AERSP 430 SPACE PROPULSION AND POWER SYSTEMS (3) Analysis and performance of chemical and nuclear rockets, electric propulsion systems. Introduction to solar, chemical, thermoelectric, and nuclear power sources. Prerequisite: AERSP 410 or M E 403
AERSP 450 ORBIT AND ATTITUDE CONTROL OF SPACECRAFT (3) Principles of mechanics and vector analysis applied to basic concepts of satellite motion and control, rocket ballistics, and gyroscopic instruments. Prerequisite: AERSP 304, AERSP 309
AERSP 473 (E MCH) COMPOSITES PROCESSING (3) An introduction to the principles of mechanics governing manufacturing, computer-aided design, and testing of composite materials and structures. Prerequisite: E MCH 471
AERSP 490 (E E;NUC E) INTRODUCTION TO PLASMAS (3) Plasma oscillations; collisional phenomena; transport properties; orbit theory; typical electric discharge phenomena. Prerequisite: E E 330 or PHYS 467
AERSP 494 AEROSPACE UNDERGRADUATE THESIS (1–3 per semester, maximum of 6) Individual problem investigations reported in written thesis and seminar lectures. Cooperative research with faculty guidance on topics of current interest. Prerequisite: seventh-semester standing
AERSP 496 INDEPENDENT STUDIES (1–18)
AERSP 497 SPECIAL TOPICS (1–9)

AFRICAN AND AFRICAN AMERICAN STUDIES (AAA S)

College of the Liberal Arts

AAA S 003 SSCHOLARSHIP AND COMMUNITY (1) Introduction to college life for new students in a designated residential community to help them optimize their Penn State experience. Prerequisite: students must be participating in the Pennypacker Experience to take this course
AAA S 083S (GH;GI) FIRST-YEAR SEMINAR IN AFRICAN AND AFRICAN AMERICAN STUDIES (3) Cultural, philosophical, economic, political, and global dynamics of the Black experience in the United States and the diaspora.
AAA S 100 (GS;GI) EVOLVING STATUS OF BLACKS IN THE TWENTIETH CENTURY: INTERDISCIPLINARY PER SPECTIVES (3) An interdisciplinary, team-taught exploration of the evolving status of Black Americans in the twentieth century. Emphasis on the civil rights movement.
AAA S 101 (GH;GI) (WMNST) THE AFRICAN AMERICAN WOMAN (3) The sociological, historical, and political experiences of African American women, their roles and contributions to society.
AAA S 102 (GH;GI) (WMNST) WOMEN OF COLOR: CROSS-CULTURAL PERSPECTIVE (3) Global examination of value systems of women of color; attention to minority ethnic groups in the United States and developing countries.
AAA S 103 (GI) (SOC;WMNST) RACISM AND SEXISM (3) Critical analysis of the structure of race and gender in the contemporary United States.
AAA S 105 (GN;GI) (EARTH) ENVIRONMENTS OF AFRICA: GEOLOGY AND CLIMATE CHANGE (3) Significant natural features of Africa as related to human endeavor; case case studies include the Nile, climate change, natural resources.
AAA S 110 (GS;GI) INTRODUCTION TO CONTEMPORARY AFRICA (3) Consideration of influences and forces shaping modern African society; analysis of current local and global problems and issues facing Africa.
AAA S 132 (GI) (SPAN) AFRO-HISPANIC CIVILIZATION (3) A general introduction to human and cultural elements of African origin in Spanish- and Portuguese-speaking countries of Latin America.
AAA S 145 (GH;GI) (RL ST) AFRICAN AMERICAN RELIGION (3) History and significance of the religious dimension of the Black American struggle for equality from enslavement to the contemporary period.
AAA S 146 (GH;GI) (RL ST) THE LIFE AND THOUGHT OF MARTIN LUTHER KING, JR. (3) A survey of the civil rights leader including his religious beliefs, intellectual development, and philosophy for social change.
AAA S 147 (GH;GI) (RL ST) THE LIFE AND THOUGHT OF MALCOLM X (3) The life of Malcolm X/El Hajj Malik El Shabazz (1925-1965) and his social, political, economic, and moral thought.
AAA S 150 (GH) AFRICA IN CINEMA (3) The study of the image of Africa as seen in fiction and non-fictional feature length films, ethnographic and documentary films.
AAA S 191 (GH;GI) (HIST) EARLY AFRICAN HISTORY (3) Explores important economic and cultural transformations in the making of early African empires from 1 MBC to 1750.
AAA S 192 (GH;GI) (HIST) MODERN AFRICAN HISTORY (3) Impact of the slave trade, expansion of Islam, colonial conquest, social and cultural transformations, resistance, nationalism, independence.
AAA S 197 SPECIAL TOPICS (1–9)
AAA S 199 (GI) FOREIGN STUDIES (1–12)
AAA S 200 (LANGUAGES OF THE AFRICAN DIASPORA IN AMERICA (3) This course focuses on the development, linguistic structures, and sociolinguistic status of the languages of the African diaspora in America.

AAA S 202 (GS;GI) (WMNST) GENDER DYNAMICS IN AFRICA (3) Critical analysis of multidisciplinary research on relations between men and women in Africa and critique of Western feminist theories.
AAA S 208 (GA;GI) (THEA) THEATRE WORKSHOP IN DIVERSE CULTURES (3) A performance-oriented class which explores the historic and contemporary theatrical works of various culturally diverse peoples.
AAA S 210 (GH;GI) (HIST) BETWEEN ACCOMMODATION AND ALIENATION: AFRICAN AMERICANS IN A JIM CROW NAT ION, 1896-1932 (3) The course will explore the context and events that shaped African American life over the period 1896-1932. Prerequisite: AAA S 100, HIST 021
AAA S 211 (GH;GI) (HIST) THE EMERGENCE AND EVOLUTION OF THE BLACK DIASPORA IN THE ATLANTIC WORLD (3) The course will explore the history and role of African and African-descent people in Africa, the Americas, and Europe. Prerequisite: AAA S 100 or HIST 003 or HIST 020 or HIST 021 or HIST 152
AAA S 235 (GI) (ENGL) AFRICAN-AMERICAN ORAL FOLK TRADITION (3) The origins, forms, and function of the oral folk tradition of African Americans. Prerequisite: ENGL 015 or ENGL 030
AAA S 240 (GH;GI) (HIST) HARLEM: HISTORY, CULTURE, AND POLITICS, 1890-PRESENT (3) This course will explore the history of Harlem as a major Black urban community and a cultural center. Prerequisite: AAA S 100 or HIST 152
AAA S 250 (GH;GI) (HIST) INTRODUCTION TO THE MODERN CARIBBEAN (3) A survey course which explores the historical evolution and emergency of the modern Caribbean.
AAA S 294 RESEARCH PROJECT (1–12)
AAA S 297 SPECIAL TOPICS (1–9)
AAA S 299 (GI) FOREIGN STUDIES (1–12)
AAA S 335 (GA;GI) (ART H) AFRICAN ART (3) Introduction to the visual arts of Africa, including contemporary African art and the influence of African art outside Africa.
AAA S 395 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
AAA S 397 SPECIAL TOPICS (1–9)
AAA S 399 (GI) FOREIGN STUDIES (1–12)
AAA S 400 AFRICAN STUDIES SEMINAR (3 per semester, maximum of 9) A study of the Organization of African Unity (OAU) leading to participation in the Model OAU Conference in Washington, D.C. Prerequisite: AAA S 110, AAA S 191
AAA S 401 AFRO-AMERICAN STUDIES SEMINAR (3) A seminar examining theoretical and methodological issues in Afro-American Studies. Prerequisite: AAA S 100, AAA S 101
AAA S 403 SOUTH AFRICA TODAY (3) A course examining the South African government's policy of apartheid: its history, why it exists, how it works, and the prospects for change. Prerequisite: AAA S 110
AAA S 404 EASTERN AND CENTRAL AFRICAN SOCIETIES (3) Cultural and historical studies of Eastern and Central Africa employing a multidisciplinary approach. Prerequisite: AAA S 191, AAA S 192
AAA S 405 AFRICAN STUDIES METHODOLOGIES (3) Multidisciplinary research techniques for studying in and about Africa.
AAA S 409 (GI) (SOC) RACIAL AND ETHNIC INEQUALITY IN AMERICA (3) The impact of inequality and discrimination on individual and group identity among various racial and ethnic groups. Prerequisite: SOC 001
AAA S 410 (WMNST) SPIRIT, SPACE, SURVIVAL: CONTEMPORARY BLACK WOMEN (3) How recent Black women have used spirit and space to survive. Prerequisite: AAA S 101
AAA S 412 (GI) (THEA) AFRICAN AMERICAN THEATRE (3) Exploration of the development of African American theatre from its roots in Africa through the diaspora to the present time. Prerequisite: THEA 100
AAA S 415 (GI) (HIST) RACE, GENDER, AND POLITICS IN THE UNITED STATES AND SOUTH AFRICA (3) This thematic course will compare key issues, figures, and events in the historical development of the United States and South Africa. Prerequisite: AAA S 100, AAA S 102, AAA S 110, AAA S 192, or HIST 152
AAA S 422 (GI) (CAS) CONTEMPORARY AFRICAN AMERICAN COMMUNICATION (3) A focused study on the continuities between African and African American culture and communication. Prerequisite: SPCOM 100
AAA S 431 (GI) (HIST) BLACK LIBERATION AND AMERICAN FOREIGN POLICY (3) This course deals with American foreign policy and Black liberation in Africa since 1945. Prerequisite: AAA S 100, AAA S 192; PL SC 001 or PL SC 014
AAA S 432 (GI) (HIST) BETWEEN NATION AND EMPIRE: THE CARIBBEAN IN THE 20TH CENTURY (3) An exploration of the political evolution of the Caribbean Region over the course of the 20th Century. Prerequisite: AAA S 250
AAA S 454 (GI) (PL SC) GOVERNMENT AND POLITICS OF AFRICA (3) Contemporary African Politics, institutions, and ideologies; patterns of change, social forces, and nation building in selected African states. Prerequisite: 3 credits from: AAA S 110, PL SC 003, PL SC 020, or PL SC 022
AAA S 465 (GI) (HIST) CIVIL RIGHTS AND AMERICAN POLITICS 1933-1968 (3) The civil rights struggle and its impact upon American politics. Prerequisite: AAA S 100, HIST 021, HIST 152, PL SC 001, or PL SC 002

AAA S 469 (GI) (ENGL) SLAVERY AND THE LITERARY IMAGINATION (3) The impact of slavery on the petitions, poetry, slave narratives, autobiographies, and novels of African Americans. Prerequisite: ENGL 015 or ENGL 030
AAA S 494 RESEARCH PROJECT (1–12)
AAA S 495 INTERNSHIP (1–18)
AAA S 496 INDEPENDENT STUDIES (1–18)
AAA S 497 SPECIAL TOPICS (1–9)
AAA S 499 (GI) FOREIGN STUDIES (1–12)

AFRO-AMERICAN STUDIES (AFRAS)

Capital College
AFRAS 301 (GI) CONTEMPORARY AFRICA (3) Study of Africa from the nineteenth century to the present in its own context including the rise and fall of European colonialism.
AFRAS 310 (GI) BLACK HISTORY TO THE TWENTIETH CENTURY (3) An examination of black political, economic, social, and cultural life in America from the era of colonization to 1905.
AFRAS 412 (GI) RACE AND ETHNICITY (3) An examination of race and ethnic relations, with an emphasis on interactions between blacks and various racial and ethnic groups in America. Prerequisite: general sociology
AFRAS 497 SPECIAL TOPICS (1–9)

AGRIBUSINESS MANAGEMENT (AG BM)

College of Agricultural Sciences
AG BM 101 (GS) ECONOMIC PRINCIPLES OF AGRIBUSINESS DECISION MAKING (3) Introduction to economic principles and their application to real world examples of agribusiness management issues.
AG BM 102 ECONOMICS OF THE FOOD SYSTEM (3) Introduction to topics designed to develop an understanding of how the food production, processing, and marketing system works and evolves.
AG BM 106 AGRIBUSINESS PROBLEM SOLVING (3) Development of quantitative problem solving skills applied to specific examples of agribusiness management problems, using EXCEL spreadsheets.
AG BM 200 INTRODUCTION TO AGRICULTURAL BUSINESS MANAGEMENT (3) Application of management principles and processes to agricultural business firms in their planning and operating in domestic and international markets.
AG BM 297, 497 SPECIAL TOPICS (1–9)
AG BM 302 FOOD PRODUCT MARKETING (3) Analysis of economic and psychological determinants of the demand for food; marketing decisions in an increasingly consumer-driven food system. Prerequisite: AG BM 101, AG BM 102, AG BM 106
AG BM 308W STRATEGIC DECISION MAKING IN AGRIBUSINESS (3) Utilize case studies to investigate strategic decision making among agribusiness firms, highlighting how information and market power shape strategies. Prerequisite: AG BM 101, AG BM 102, AG BM 106
AG BM 320 MARKETS AND PRICES: ANALYSIS AND FORECASTING (3) Understand how prices are determined; develop the skill to analyze and forecast how prices change as the underlying conditions change. Prerequisite: AG BM 101, AG BM 102, AG BM 106
AG BM 338 AGRIBUSINESS IN THE GLOBAL ECONOMY (3) Managing agribusinesses in the global food industry, international food product marketing, key public institution and policies affecting food trade. Prerequisite: AG BM 101, AG BM 102, AG BM 106
AG BM 407 FARM PLANNING AND FINANCIAL MANAGEMENT (3) Economic principles applied to the management of farms, with particular emphasis on the financial aspects of management. Prerequisite: AG BM 101, AG BM 106
AG BM 408 FINANCIAL DECISION MAKING FOR AGRIBUSINESS (3) Develop financial management and business analysis skills, integrating previous course work and finance training; principles of financial management, planning, control. Prerequisite: AG BM 308W, B A 301
AG BM 420 AGRIBUSINESS MARKETS & PRICES (3) Understand and forecast price level and volatility for commodities, differentiated products, services. Why markets work and why they may not. Prerequisite: 6 credits in Agribusiness Management, Business Administration, Agricultural Economics, and/or Economics
AG BM 440 FOOD PRODUCT INNOVATION MANAGEMENT (3) A problem-based course designed to enhance decision-making skills in the context of industry's approach to developing new food products. Prerequisite: AG BM 302 or junior/senior standing in Food Science
AG BM 460 MANAGING THE FOOD SYSTEM (3) Firm management in the food system; coordination with suppliers and customers, including supply chain management, strategic thinking, risk management. Prerequisite: AG BM 320, AG BM 338
AG BM 461W MANAGERIAL ECONOMICS IN AGRICULTURAL BUSINESS FIRMS (3) Economic analysis of management problems encountered in agricultural business firms. Prerequisite: FIN 301, 6 CREDITS IN AGRICULTURAL ECONOMICS OR ECONOMICS
AG BM 495A INTERNSHIP IN AGRIBUSINESS AND RURAL DEVELOPMENT (1–6) Supervised field experience in an agribusiness or rural development setting. Prerequisite: prior approval by department
AG BM 495B INTERNSHIP IN INTERNATIONAL AGRIBUSINESS (6) Supervised field experience related to student's major, minor, or option. Prerequisite: PRIOR APPROVAL BY DEPARTMENT
AG BM 496 INDEPENDENT STUDIES (1–18)

AGRICULTURAL AND BIOLOGICAL ENGINEERING (A B E)

College of Agricultural Sciences; College of Engineering

A B E 001S GROWING YOUR FUTURE—FIRST-YEAR SEMINAR (1) Introduce students to University life, the agricultural/biological/engineering program and profession; prepare them to succeed in academic life at Penn State. Prerequisite: first-year status

A B E 097 SPECIAL TOPICS (1–9)

A B E 296 INDEPENDENT STUDIES (1–18)

A B E 297 SPECIAL TOPICS (1–9)

A B E 400 BIOLOGICAL SYSTEMS (3) Structure, function, and energy transformation of biological systems that affect solutions to engineering problems. Effects of engineering activities on ecosystems. Prerequisite: CHEM 012 and PHYS 211

A B E 401 MODELING METHODS FOR BIOLOGICAL SYSTEMS (3) Programming logic and languages; linear system of equations, numerical methods and software applied to bio-physical systems. Prerequisite: or concurrent: MATH 251

A B E 402 TRANSPORT PROCESSES FOR BIOLOGICAL PRODUCTION (3) Engineering applications of the fundamentals of fluid mechanics; heat transfer, sedimentation, diffusion, and lighting to biological production in bioreactors, indoor environments, and outdoor environments. Prerequisite: A B E 400, A B E 401; M E 023 or M E 030; C E 360 or M E 033

A B E 403 STRUCTURAL SYSTEMS IN AGRICULTURE (1.5) Engineering analysis and design of structural systems in agriculture; topics: loads, connectors, analysis and design of structural members and systems. Prerequisite: A B E 401, E MCH 013

A B E 404 ENGINEERING PROPERTIES OF FOOD AND BIOLOGICAL MATERIALS (3) Composition, structure, and properties relationships. Measurement of mechanical thermal, chemical and biological properties, their variability, and use in engineering calculations. Prerequisite: E MCH 013. Prerequisite or concurrent: A B E 400; C E 360 or M E 033; MATH 251

A B E 405 AGRICULTURAL MEASUREMENTS AND CONTROL SYSTEMS (3) Principles of measurements, instruments, controls, and data acquisition systems, with emphasis on agricultural applications. Prerequisite: E E 305

A B E 406 POWER SYSTEMS IN AGRICULTURE (1.5) Engineering analysis and design of power generation and transmission systems; topics: reliability, motors, diesel engines, fluid power, mechanical power transmission. Prerequisite: A B E 401, E MCH 012, E MCH 013 Concurrent: A B E 403

A B E 408 ENGINEERING ELEMENTS OF BIOCHEMISTRY AND MICROBIOLOGY (3) Introduction to basic biochemistry and microbiology as well as industrial and environmental applications. Prerequisite: CHEM 012

A B E 461 DESIGN OF FLUID POWER SYSTEMS (3) Hydraulic power systems, hydrostatic transmissions, and electro-hydraulic control systems with applications in agricultural production and processing systems. Integrated design projects. Prerequisite: A B E 406 or M E 051; C E 360 or M E 033

A B E 462 DESIGN OF WOOD STRUCTURES (3) Structural properties of wood; design of wood structural elements; design of wood structural systems; design of post-frame buildings. Prerequisite: A B E 403, A E 308, OR C E 340

A B E 465 FOOD AND BIOLOGICAL PROCESS ENGINEERING (4) Reactor design, kinetics, fluid flow, thermal processes, and other topics applied to the design of systems for the food and biological process industry. Prerequisite: A B E 402

A B E 467 DESIGN HYDROLOGY AND SEDIMENTOLOGY (4) Applications of hydrology to small catchments; design of erosion control practices, sedimentation basins, porous structures, and filter strips. Prerequisite: A B E 402 or C E 361

A B E 468 MICROBIOLOGICAL ENGINEERING (4) Application of basic engineering principles and designs in biochemical and biological processes. Prerequisite: A B E 408 or B M B 211 and MICRO 201; PHYS 211 or PHYS 250

A B E 469W OPTIMIZATION OF BIOLOGICAL PRODUCTION AND PROCESSING SYSTEMS (3) Engineering and biological principles combined with economics and mathematical techniques to evaluate and optimize biological production and processing systems. Prerequisite: A B E 402, A B E 403, A B E 406

A B E 471 ENGINEERING PRINCIPLES OF AGRICULTURAL MACHINES (1) Functional design of agricultural equipment. Topics include traction, tillage, planting, harvesting, chemical application, conveying. Concurrent: A B E 461

A B E 472 FUNCTIONAL DESIGN OF AGRICULTURAL BUILDINGS (1) Integration of the functional environmental and structural design of agricultural buildings, especially animal housing and greenhouses. Prerequisite: A B E 402

A B E 475 FOOD ENGINEERING EQUIPMENT DESIGN (3) Engineering analysis and operation of pilot-plant equipment, i.e., spray, freeze and deep bed dryers, evaporators, freezing tunnels, distillation columns. Prerequisite: A B E 465

A B E 475 FOOD ENGINEERING EQUIPMENT DESIGN (3) Engineering analysis and operation of pilot-plant equipment, i.e., spray, freeze and deep bed dryers, evaporators, freezing tunnels, distillation columns. Prerequisite: A B E 465

A B E 490W AGRICULTURAL AND BIOLOGICAL ENGINEERING COLLOQUIUM (1) Identification and analysis of the opportunities for professional development in the agricultural and biological engineering profession. Prerequisite: sixth-semester or higher standing in Agricultural and Biological Engineering

A B E 494 SENIOR THESIS (1–9) Students must have approval of a thesis adviser before scheduling this course.
A B E 494H SENIOR HONORS THESIS (1–3) Senior honors thesis. Prerequisite: junior or senior status in the University Scholar's program
A B E 495 AGRICULTURAL ENGINEERING INTERNSHIP (1–6) Independent study and supervised cooperative education experience related to the student's career objective.
A B E 496 INDEPENDENT STUDIES (1–18)
A B E 497 SPECIAL TOPICS (1–9)

AGRICULTURAL COMMUNICATIONS (AGCOM)

College of Agricultural Sciences; College of Communications
AGCOM 462W ADVANCED AGRICULTURAL WRITING (3) Practice in journalistic writing strategies to report scientific and technical information in the agricultural/environmental sciences to general audiences. Prerequisite: a grade of C or better required in COMM 260W or equivalent course work
AGCOM 495 INTERNSHIP (1–3) Supervised field experiences related to student's professional interest in agricultural communications; limited to minors in agricultural communications. Prerequisite: a grade of C or better required in COMM 260W; and prior approval of the professor-in-charge of minor

AGRICULTURAL ECONOMICS (AG EC)

College of Agricultural Sciences
AG EC 201 (E RRE) INTRODUCTORY ENVIRONMENTAL AND RESOURCE ECONOMICS (3) Apply principles of economics to analyze environmental protection policies and natural resource use decisions. Examine contemporary policy issues. Prerequisite: AG EC 101 or ECON 002
AG EC 208 FARM RECORDS AND ACCOUNTS (3) Practice in keeping, analyzing, interpreting records; systems of accounts to meet needs of individual farm situations.
AG EC 232 MARKETING DAIRY PRODUCTS (3) Economics of marketing dairy products; factors affecting price, production, and utilization of milk; role of cooperatives; price plans and policies.
AG EC 296 INDEPENDENT STUDIES (1–18)
AG EC 306 AGRICULTURAL FINANCE (3) Agricultural finance in farm firms and financial institutions, emphasizing financial analysis, liquidity, and risk. Prerequisite: 6 credits in agricultural economics or economics
AG EC 307 INTRODUCTION TO AGRICULTURAL ECONOMIC ANALYSIS (3) Application of production theory to agricultural problems, risk and uncertainty, interregional competition, economies of size, supply and demand relationships. Prerequisite: AG EC 101 or ECON 002
AG EC 350 INTERNATIONAL AGRICULTURAL TRADE (3) The economics of international agricultural trade, agricultural trade policy. Prerequisite: AG EC 101 OR ECON 002
AG EC 404 (E RRE) METHODS IN NATURAL RESOURCE AND ENVIRONMENTAL ECONOMICS (3) Empirical research methodology in the areas of environmental and natural resource economics. Prerequisite: AG EC 201 or ECON 302, ECON 428
AG EC 410 AGRICULTURAL REAL ESTATE APPRAISAL (3) Factors affecting value of agricultural real property; methods and processes of agricultural real estate appraisal. Prerequisite: 6 credits in agricultural economics or economics
AG EC 429 (E RRE) NATURAL RESOURCE ECONOMICS (3) Optimal management of resources; roles of markets and other institutions; resources and economic development; public policy. Prerequisite: ECON 302
AG EC 430 (CEDEV) PRINCIPLES OF COMMUNITY ECONOMIC DEVELOPMENT (3) Concepts, strategies and techniques of local economic analysis, planning and development; case studies and decision-making exercises. Prerequisite: introductory course in economics
AG EC 431W (E RRE) ECONOMIC ANALYSIS OF ENVIRONMENTAL AND RESOURCE POLICIES (3) Economic Analysis of environmental and natural resource policies, benefit-cost analysis, non-market valuation techniques, resource damage assessment. Prerequisite: ECON 302
AG EC 432 (CEDEV) TECHNIQUES OF COMMUNITY ECONOMIC DEVELOPMENT PLANNING (3) Techniques of financial and organizational analysis applied to actual community economic development problems; utilization of innovative economic development strategies and methods. Prerequisite: AG EC 430
AG EC 450 (GI) INTERNATIONAL DEVELOPMENT, RENEWABLE RESOURCES, AND THE ENVIRONMENT (3) Theories of agricultural and economic developmment, with particular attention to interactions between development, renewable resources, and the environment. Prerequisite: 6 credits in agricultural economics or economics
AG EC 490 SEMINAR IN AGRICULTURAL BUSINESS MANAGEMENT (3) Contemporary issues in agricultural business management. Prerequisite: AG BM 200
AG EC 499 (GI) FOREIGN STUDY—AGRICULTURAL ECONOMICS (1–12) Study in selected countries of agricultural economic institutions and current agricultural economic problems.

AGRICULTURAL AND EXTENSION EDUCATION (AEE)

College of Agricultural Sciences
AEE 100 AGRICULTURAL EDUCATION ORIENTATION (2) Examination of agricultural and extension education; exploration of aptitude and interest in teaching, including early clinical practicum.

AEE 205 TEACHING AGRICULTURAL AND ENVIRONMENTAL SCIENCE COMPETENCIES (1 per semester, maximum of 2) Practicum to develop students' pedagogical and technical competence for teaching agricultural mechanics; agricultural business management; plant, animal, and soil science.
AEE 295 OBSERVATION OF TEACHING IN AGRICULTURE AND ENVIRONMENTAL SCIENCE (1–3) Supervised observation of teacher and student activities in a selected high school; appraisal of related responsibilities of teachers of agriculture.
AEE 296 INDEPENDENT STUDIES (1–12)
AEE 297 SPECIAL TOPICS (1–9)
AEE 298 SPECIAL TOPICS (1–9)
AEE 311 DEVELOPING YOUTH LEADERSHIP THROUGH ORGANIZATION AND PROGRAM STRUCTURE (3) Basic strategies and procedures for effectively coordinating Supervised Occupational Experiences, Future Farmers of America, and Young Farmer Association activities in secondary and postsecondary schools.
AEE 311L DEVELOPING YOUTH LEADERSHIP THROUGH ORGANIZATION AND PROGRAM STRUCTURE (3) Basic strategies and procedures for effectively coordinating Supervised Occupational Experiences, Future Farmers of America, and Young Farmer Association activities in secondary and postsecondary schools.
AEE 311P DEVELOPING YOUTH LEADERSHIP THROUGH ORGANIZATION AND PROGRAM STRUCTURE Basic strategies and procedures for effectively coordinating Supervised Occupational Experiences, Future Farmers of America, and Young Farmer Association activities in secondary and postsecondary schools.
AEE 313 SCHOOL-BASED PROGRAM PLANNING AND INSTRUCTIONAL DEVELOPMENT (2) Planning and developing courses of study, summer programs, advisory committees, and facilities for vocational agriculture. Prerequisite: AEE 100, AEE 295, AEE 311
AEE 330W COMMUNICATION IN AGRICULTURAL AND NATURAL RESOURCE CAREERS (3) The course explores the conventions of writing and speaking found in agricultural professions through the use of case studies. Prerequisite: ENGL 015
AEE 350 TEACHING METHODS FOR AGRICULTURAL AND ENVIRONMENTAL LABORATORIES (3) An introductory course that prepares students to instruct and manage students in laboratory settings.
AEE 360 LEADERSHIP DEVELOPMENT FOR SMALL GROUPS (3) Students will learn about leadership dynamics in small groups and how to be more influential in work settings.
AEE 395 INTERNSHIP (1–13) Supervised off-campus, non-group instruction including individual field experiences, practicums or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
AEE 397 SPECIAL TOPICS (1–9)
AEE 398 SPECIAL TOPICS (1–9)
AEE 400 EDUCATIONAL PROGRAMS IN AGRICULTURE FOR DEVELOPING COUNTRIES (3) Development and implementation of educational programs in agriculture in developing countries. Prerequisite: INTAG 100 or INTAG 481
AEE 412 METHODS OF TEACHING AGRICULTURE AND ENVIRONMENTAL SCIENCE (4) Instructional strategies and media; directing individual and group learning activities; assessing student performance and quality of instruction in vocational agriculture.
AEE 413 PROGRAM PLANNING AND INSTRUCTIONAL DEVELOPMENT (3–4) WWW course for planning, developing, and organizing school-based curriculum, summer programs, advisory councils, and facilities for environmental/ agricultural education.
AEE 418 EFFECTIVE LABORATORY DEVELOPMENT FOR AGRICULTURAL AND ENVIRONMENTAL SCIENCE (1–4) Current problems and practices; issues and policies; relationships involving other educational services and agencies.
AEE 424 WORKFORCE GUIDANCE IN AGRICULTURAL INDUSTRY (1–4) Opportunities and developments in agricultural industry, on-farm agricultural work, professional agricultural positions, and off-farm, nonprofessional agricultural occupations.
AEE 426 ADULT EDUCATION IN AGRICULTURE AND NATURAL RESOURCES (1–4) Organization, conduct, and appraisal of instruction in agriculture to include farming and off-farm agricultural occupations. Prerequisite: AEE 311
AEE 430 (R P M) ENVIRONMENTAL EDUCATION METHODS AND MATERIALS (3) Methods and materials for developing, implementing, and evaluating environmental education programs within formal and nonformal educational settings. Prerequisite: R P M 325 or AEE 100
AEE 434 AGRICULTURAL AND ENVIRONMENTAL DEVELOPMENT (1–6) Intensive professional and technical treatment of various subject-matter fields to aid teachers in maintaining competence. Prerequisite: senior-year standing or experience as a teacher or extension agent
AEE 437 (AN SC) EQUINE FACILITATED THERAPY (3) Equine Facilitated Therapy uses equine-related activities to contribute positively to the wellbeing of people with disabilities.
AEE 440 COMMUNICATION METHODS AND MEDIA (3) Mass media techniques for reporting and promoting extension and related programs, including message preparation, presentation, and strategy development. Prerequisite: 3 credits in communication
AEE 450 PROGRAM DESIGN AND DELIVERY (3) Principles, methods, and practices of extension education in agriculture, community resource development, family living, environmental affairs, 4-H, and youth programs. Prerequisite: 6 credits in social or behavioral sciences

AEE 460 FOUNDATIONS IN LEADERSHIP DEVELOPMENT (3) This course explores historical and contemporary leadership theories, models and perspectives within social, cross-cultural, and political contexts. Prerequisite: AEE 360
AEE 465 LEADERSHIP PRACTICES: POWER, INFLUENCES, AND IMPACT (3) Explores the leader role as it relates to issues of purpose, social responsibility, political influences, and legal constraints.
AEE 490 COLLOQUIUM (1–3) Seminars consisting of a series of individual lectures by faculty, students, or outside speakers.
AEE 495 INTERNSHIP IN AGRICULTURAL AND EXTENSION EDUCATION (1–15) Participation in the total program of instruction in agriculture in a selected high school. Prerequisite: AEE 412, AEE 413
AEE 496 INDEPENDENT STUDIES (1–18)
AEE 497, 498 SPECIAL TOPICS (1–9)
AEE 499 (GI) FOREIGN STUDIES (1–12)

AGRICULTURAL SCIENCE (AG SC)

College of Agricultural Sciences
AG SC 296, 496 INDEPENDENT STUDIES (1–18)
AG SC 297, 298; 397, 398; 497, 498 SPECIAL TOPICS (1–9)
AG SC 495 INTERNSHIP (1–10) Independent study and supervised field experience related to the student's professional interest. Intended for Agricultural Science majors. Prerequisite: fifth-semester standing in the Agricultural Science major with a GPA of 2.00 or greater and prior approval of proposed plan before registration

AGRICULTURAL SYSTEMS MANAGEMENT (A S M)

College of Agricultural Sciences
A S M 101 MECHANIZATION PRINCIPLES FOR PRODUCTION AGRICULTURE (3) Applying engineering and mechanization principles for selection and application of agricultural equipment, structural environmental control, and soil and water conservation.
A S M 217 LANDSCAPE SOIL AND WATER MANAGEMENT (3) Landscape soil and water management and practices including irrigation, hydrology, erosion, open channel, drainage, and impoundments.
A S M 221 INTRODUCTION TO AGRICULTURAL SYSTEMS MANAGEMENT (3) Application of engineering principles critical to agricultural systems management. Prerequisite: MATH 110, PHYS 250
A S M 296 INDEPENDENT STUDIES (1–18)
A S M 297 SPECIAL TOPICS (1–9)
A S M 310 POWER TRANSMISSION IN AGRICULTURE (3) Selection and maintenance of mechanical, hydraulic, and pneumatic power transmission components and systems. Electric motor principles and controls. Prerequisite: or concurrent: A S M 221
A S M 320 COMBUSTION ENGINES FOR MOBILE EQUIPMENT (3) Operating principles of internal combustion engines; performance, selection, and maintenance aspects of engine systems in mobile equipment. Prerequisite: A S M 310
A S M 326 HAZARD IDENTIFICATION AND CONTROL IN PRODUCTION AGRICULTURE AND RELATED BUS INESSES (2) Identification and control of hazards common to farms and agriculturally related rural businesses, including structures, equipment, animals, chemicals, outdoor environment. Prerequisite: third-semester or higher
A S M 327 SOIL AND WATER RESOURCE MANAGEMENT (3) Soil and water management systems and practices including hydrology, surface drainage, open channels, and erosion, subsurface drainage, impoundments and irrigation. Prerequisite: PHYS 250
A S M 327L SOIL AND WATER RESOURCE MANAGEMENT (3) Soil and water management systems and practices including hydrology, surface drainage, open channels, and erosion, subsurface drainage, impoundments and irrigation. Prerequisite: PHYS 250
A S M 327P SOIL AND WATER RESOURCE MANAGEMENT (3) Soil and water management systems and practices including hydrology, surface drainage, open channels, and erosion, subsurface drainage, impoundments and irrigation. Prerequisite: PHYS 250
A S M 407 TURFGRASS IRRIGATION AND DRAINAGE (3) Turfgrass irrigation especially golf course systems. Sprinkler selection; piping; control systems; pumps; scheduling. Surface and subsurface golf course drainage topics. Prerequisite: MATH 021, SOILS 101
A S M 420 OFF-ROAD POWER UNITS (3) Cabs, traction, power allocation, and electronic systems for tractors and other off-road vehicles; requirements for production agriculture, logging, and construction. Prerequisite: or concurrent: A B E 406 or A S M 320
A S M 422 ENVIRONMENTAL SYSTEMS FOR AGRICULTURAL BUILDINGS (3) Planning and layout of environmental control systems for agricultural production and storage buildings; functional planning of agricultural buildings. Prerequisite: A S M 221

A S M 424 SELECTION AND MANAGEMENT OF AGRICULTURAL MACHINERY (3) Function and operation of field and farmstead machines; energy, quality, and loss considerations; selection and utilization; precision agriculture technology. Prerequisite: or concurrent: A B E 406 or A S M 320
A S M 425 PHYSICAL PRINCIPLES IN FOOD PROCESSING (3) Dimensions and units, mass and energy balances, fluid flow, heat transfer, refrigeration, freezing, psychrometrics, evaporation and dehydration in food processing. Prerequisite: MATH 110, PHYS 250
A S M 426 MANAGEMENT OF SAFETY AND HEALTH ISSUES IN PRODUCTION AGRICULTURE AND REL ATED BUSINESSES (3) Management of safe workplaces and workers, hazard identification, employee training, legal responsibilities, and program development for farms and related businesses. Prerequisite: A S M 326
A S M 428 ELECTRIC POWER AND INSTRUMENTATION IN AGRICULTURE (3) Basic principles and applications of electric circuits for power distribution, electric motors, automatic controls, and instrumentation used in agriculture. Prerequisite: A S M 221, A S M 310
A S M 429W AGRICULTURAL SYSTEMS ANALYSIS AND MANAGEMENT (3) Theory of systems thinking; quantitative techniques for analysis and optimization; and qualitative approaches for agricultural decision-making processes. Prerequisite: MATH 110, PHYS 250, 12 credits of A S M courses, computer experience
A S M 457 LAND APPLICATION OF WASTES (3) Analysis, design, and management of land waste disposal systems, including on- lot sewage, municipal sewage effluent, and agricultural waste systems. Prerequisite: A S M 217, A S M 327, A B E 402, or C E 370
A S M 490 AGRICULTURAL SYSTEMS MANAGEMENT SEMINAR (1) Senior seminar to prepare Agricultural Systems Management graduates for positions in business, industry, government service and to foster continuing professional growth.. Prerequisite: sixth-semester standing
A S M 495 INTERNSHIP (1–18)
A S M 496 INDEPENDENT STUDIES (1–18)
A S M 497 SPECIAL TOPICS (1–9)

AGRICULTURE—GENERAL (AG)

College of Agricultural Sciences

AG 100 JOB PLACEMENT SKILLS AND STRATEGIES (1) Strategies and skills designed to identify career/life goals and implement career decisions.
AG 113 EXPLORING CAREERS IN AGRICULTURE (1) Examination of career opportunities in agriculture with an exploration of the relationship between student interest and career decisions.
AG 150S BE A MASTER STUDENT! (2) Students explore agricultural issues and research methodologies through literature review, library searches, field studies, and critical thinking. Prerequisite: first- or second-semester standing
AG 160 (GH) INTRODUCTION INTO ETHICS AND ISSUES IN AGRICULTURE (3) The course explores ethical theories, concepts of critical thinking, and major ethical issues related to American agriculture.
AG 200A MICROCOMPUTER APPLICATIONS IN AGRICULTURE (2) Introduction to the use of microcomputers in agriculture. Emphasis is placed on the use of commercial software on "DOS-based" computers. Intended for majors in the College of Agriculture.
AG 200B MICROCOMPUTER APPLICATIONS IN AGRICULTURE (2) Introduction to the use of microcomputers in agriculture. Emphasis is placed on the use of commercial software on "ICON-based" computers. Intended for majors in the College of Agriculture.
AG 294 RESEARCH PROJECT COURSES (1–12)
AG 297 SPECIAL TOPICS (1–9)
AG 301W INTRODUCTION TO AGRICULTURAL LAW (3) A survey of the legal system and legal issues that typically arise in agricultural and agribusiness situations.
AG 400 BIOMETRY/STATISTICS IN THE LIFE SCIENCES (4) Application of statistical techniques to experimental and survey research in the life sciences. Prerequisite: 6 credits in the natural sciences
AG 451 (FOR) ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS FOR AGRICULTURE AND NATURAL RES OURCE MANAGEMENT (3) Application of artificial intelligence in agriculture and natural resources, with emphasis on expert systems. Prerequisite: One course in computer science or computer applications
AG 494 RESEARCH PROJECT COURSES (1–12)
AG 495 INTERNSHIP (1–18) Independent study and supervised field experience related to the student's major. Written and oral critique of activity required. Prerequisite: approval of proposed assignment by instructor prior to advance registration deadline in semester preceding that semester in which the assignment is to be carried out
AG 497 SPECIAL TOPICS (1–9)

AGROECOLOGY (AGECO)

College of Agricultural Sciences

AGECO 121 (GN) PLANT STRESS: IT'S NOT EASY BEING GREEN (3) The many hazards faced by plants and the dynamic ways that plants respond to these problems are examined.

AGECO 134 (GN) (PL SC) SUSTAINABLE AGRICULTURE SCIENCE AND POLICY (3) The science, economics, and politics of managing food production systems; current practices and options for the future.
AGECO 295 AGROECOLOGY INTERNSHIP (1–18)
AGECO 418 (AN SC;SOILS) NUTRIENT MANAGEMENT IN AGRICULTURAL SYSTEMS (3) Comprehensive review of nutrient flow in animal agricultural systems, environmental regulations, and environmental stewardship practices.
AGECO 495 AGROECOLOGY INTERNSHIP (1–18)

AGRONOMY (AGRO)

College of Agricultural Sciences
AGRO 028 PRINCIPLES OF CROP MANAGEMENT (3) Biological and agronomic principles applied to production and management of major feed and forage crops of the northeastern United States. Prerequisite: 6 credits in biological science
AGRO 297 SPECIAL TOPICS (1–9)
AGRO 410W CROP SCIENCE (4) Study of the relation of crop plants to their environment, crop ecology, and the physiology of crop growth. Prerequisite: AGRO 028, BIOL 102
AGRO 423 FORAGE CROP MANAGEMENT (3) Application of agronomic, ecological, and physiological principles to the production and management of pasture and forage crops. Prerequisite: AGRO 028
AGRO 425 FIELD CROP MANAGEMENT (3) Application of agronomic, ecological, and physiological principles to management systems for the efficient production of the major field crops. Prerequisite: AGRO 028
AGRO 438A PRINCIPLES OF WEED CONTROL AND HERBICIDE PROPERTIES (5) Weed propagation, life cycles, competition and adaptation, herbicide properties and mode of action, principles of cultural and herbicidal weed control. Prerequisite: CHEM 012, CHEM 013, 6 credits in plant sciences
AGRO 438B WEED IDENTIFICATION (1) Identification of 150 weeds common to the Northeastern United States. Prerequisite: 6 credits in plant sciences
AGRO 460 (BIOTC) MOLECULAR GENETICS OF TRANSGENIC PLANTS (3) Understanding the biology and inheritance of genetic traits through the use of genetically modified plants, progress on developments of transgenic crops, their advantages, problems and regulatory issues. Prerequisite: BIOL 230W, B M B 251
AGRO 489 SUPERVISED EXPERIENCE IN COLLEGE TEACHING (1–3) Participate with instructors in teaching an undergraduate agronomy course; assist with teaching, evaluation, and development of instructional materials. Prerequisite: AGRO 028, approval of instructor
AGRO 490 (SOILS) COLLOQUIUM (1) Continuing written and oral presentations developed by students in consultation with the course instructor. Prerequisite: seventh-semester standing
AGRO 495 INTERNSHIP (1–5)
AGRO 496 INDEPENDENT STUDIES (1–18)
AGRO 497 SPECIAL TOPICS (1–9)

AIR FORCE (AIR)

Intercollege; Reserve Officers' Training Corps
GENERAL MILITARY COURSES
AIR 151 THE FOUNDATIONS OF THE UNITED STATES AIR FORCE I (2) Survey course designed to introduce students to Air Force opportunities, officership, professionalism, and military customs and courtesies, and communication skills.
AIR 152 THE FOUNDATIONS OF THE UNITED STATES AIR FORCE II (2) Continued study of officership and leadership. Mission and organization of today's Air Force are discussed.
AIR 251 THE EVOLUTION OF USAF AIR AND SPACE POWER I (2) Examines aspects of air and space power from the first balloons to the beginning of the Cold War era.
AIR 252 THE EVOLUTION OF USAF AIR AND SPACE POWER II (2) Continued examination of air and space power from the Cold War era to the Persian Gulf War and beyond.
PROFESSIONAL OFFICER COURSES
AIR 351 LEADERSHIP STUDIES I (3) Study of leadership, management fundamentals, and communication skills required of Air Force officers. Students apply these concepts using case studies.
AIR 352 LEADERSHIP STUDIES II (3) Continued study of leadership includes professional knowledge, AF personnel evaluation systems, and leadership ethics. Students apply concepts using case studies.
AIR 451 NATIONAL SECURITY AFFAIRS/PREPARATION FOR ACTIVE DUTY I (3) This course examines the national security process, regional studies, advanced leadership ethics, and Air Force doctrine.
AIR 452 NATIONAL SECURITY AFFAIRS/PREPARATION FOR ACTIVE DUTY II (3) Topics focus on preparation for military service after commissioning and current issues affecting the Air Force way of life.

AMERICAN STUDIES (AM ST)

College of the Liberal Arts
AM ST 050 THE LITERATURE AND LORE OF MINING (3) Experience and values of mining tradition: survey of the literature and lore, including field research.
AM ST 083S (GH) FIRST-YEAR SEMINAR IN AMERICAN STUDIES (3) Critical approaches to the interdisciplinary study of American culture.

AM ST 100 (GH) INTRODUCTION TO AMERICAN STUDIES (3) A study of selected attempts to identify and interpret movements and patterns in American culture. Prerequisite: third-semester standing
AM ST 100W (GH) INTRODUCTION TO AMERICAN STUDIES (3) A study of selected attempts to identify and interpret movements and patterns in American culture. Prerequisite: third-semester standing
AM ST 104 (GH;GI) (WMNST) WOMEN AND THE AMERICAN EXPERIENCE (3) Selected aspects of the role of women in United States history and culture from colonial to modern times.
AM ST 105 (GH;GI) AMERICAN POPULAR CULTURE AND FOLKLIFE (3) Survey of popular culture, folklife, and ethnicity, synthesizing material from such areas as literature, media, entertainment, print, music, and film.
AM ST 108 THE AMERICAN DREAM AND THE VIETNAM WAR (3) Interdisciplinary study of the Vietnam War experience as it affected American culture; focus on legacies including gender, race, and ethnicity.
AM ST 140W (GH;GI) (RL ST) RELIGION IN AMERICAN LIFE AND THOUGHT (3) The function, contributions, tensions, and perspectives of religion in American culture.
AM ST 187 AMERICAN STUDIES FRESHMAN SEMINAR (3) The meaning and advantages of a Liberal Arts education in context of a specific discipline. Prerequisite: first-semester standing
AM ST 187S REVISITING JEFFERSON'S WASHINGTON: RESEARCH/WRITING/PRESENTATION (3) The in-situ seminar will teach hands-on and electronic research/writing skills in a collaborative/laptop setting.
AM ST 187T REVISITING JEFFERSON'S WASHINGTON: RESEARCH/WRITING/PRESENTATION (3) The in-situ seminar will teach hands-on and electronic research/writing skills in a collaborative/laptop setting.
AM ST 193 (ENGL) AMERICAN FOLK SONG IN ENGLISH (3) British songs in America; native repertoire, white and black; folk ballad; and musical development.
AM ST 196 (ENGL) INTRODUCTION TO AMERICAN FOLKLORE (3) A basic introduction to verbal and nonverbal folklore stressing the basic procedures of collection, classification, and analysis.
AM ST 196 (GH;GI) (ENGL;AMSTD) INTRODUCTION TO AMERICAN FOLKLORE (3) A basic introduction to verbal and nonverbal folklore stressing the basic procedures of collection, classification, and analysis.
AM ST 197 SPECIAL TOPICS (1–9)
AM ST 199 (GI) FOREIGN STUDIES (1–12)
AM ST 294 RESEARCH PROJECT (1–12)
AM ST 296 INDEPENDENT STUDIES (1–18)
AM ST 297 SPECIAL TOPICS (1–9)
AM ST 299 (GI) FOREIGN STUDIES (1–12)
AM ST 395 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
AM ST 399 (GI) FOREIGN STUDIES (1–12)
AM ST 401 (PHIL) AMERICAN PHILOSOPHY (3) Survey of key figures and movements in American thought, including the Transcendentalists, the Pragmatists, and contemporary developments. Prerequisite: 9 credits of philosophy, or 6 credits of philosophy at the 200-level
AM ST 402W AMERICAN THEMES, AMERICAN ERAS (3–6) Interdisciplinary American culture course on major themes and eras such as the American Revolutionary Era or the 1930s. Prerequisite: seventh-semester standing
AM ST 405 ETHNICITY AND THE AMERICAN EXPERIENCE (3) Theoretical and conceptual framework of ethnic studies: examination of specific issues related to major American ethnic and racial groups.
AM ST 406 AMERICAN REGIONAL CULTURES (3–6) An interdisciplinary study of the culture of a region of the United States, such as the south or the west. Prerequisite: seventh-semester standing
AM ST 410 EARLY PENNSYLVANIA DECORATIVE ARTS AND FURNITURE (3) The study of Pennsylvania and related furniture, pottery, paintings, and decorative arts of the seventeenth, eighteenth, and early nineteenth centuries.
AM ST 415 NINETEENTH CENTURY PENNSYLVANIA ARCHITECTURE AND RESTORATION (3) Interior and exterior design of early Pennsylvania architecture; understanding and evaluation of and experience in restoration. Prerequisite: AM ST 410
AM ST 422 (RL ST) RELIGION AND AMERICAN CULTURE (3 per semester, maximum of 6) Selected topics, problems, or historical movements in American religion; relation between religion and American culture.
AM ST 493 (ENGL) THE FOLKTALE IN AMERICAN LITERATURE (3) A survey of the literary uses of the folktale and legendary materials, with particular concentration on the literature of America. Prerequisite: ENGL 015 or ENGL 030
AM ST 494 RESEARCH PROJECT (1–12)
AM ST 496 INDEPENDENT STUDIES (1–18)
AM ST 497 SPECIAL TOPICS (1–9)
AM ST 499 (GI) FOREIGN STUDIES (1–12)

AMERICAN STUDIES (AMSTD)

Capital College

AMSTD 196 (GH;GI) (AM ST;ENGL) INTRODUCTION TO AMERICAN FOLKLORE (3) A basic introduction to verbal and nonverbal folklore stressing the basic procedures of collection, classification, and analysis.

AMSTD 301 (GH) AMERICAN CIVILIZATION (3) An interdisciplinary overview of major themes, works, and events, in American history and culture. Prerequisite: HIST 020 or HIST 021 or 3 credits in American Studies

AMSTD 302 APPROACHES TO AMERICAN STUDIES (3) A survey of the American Studies movement and its scholarship, emphasizing changes in theories, methods, and topics. Prerequisite: AMSTD major or permission of program

AMSTD 320 PENNSYLVANIA STUDIES (3 per semester) Study of selected topics on the history, society, and culture of Pennsylvania (May be repeated for credit). Prerequisite: HIST 012 or 3 credits of American Studies

AMSTD 321 (GI) AMERICAN INDIAN STUDIES (3 per semester) A study of American Indian history, societies and cultures (may be repeated for for credit). Prerequisite: 3 credits of American Studies or ANTH 146 or HIST 153

AMSTD 322 (GI) ETHNIC AMERICA (3) A study of the sources, contributions, and conflicts of ethnic groups in the American experience. Prerequisite: 3 credits of American Studies or HIST 158 or SOC 119.

AMSTD 323 AMERICAN FOLKLORE AND FOLKLIFE (3) A study of American folklore and folklife, including folkloristic approaches to verbal, gestural, social, and material expressions of culture. Prerequisite: 3 credits of American Studies

AMSTD 324 POPULAR CULTURE (3) An examination of mass media and society and the impact of popular culture. Prerequisite: AM ST 105 or 3 credits of American Studies

AMSTD 325 (PUBPL) AMERICAN POLITICAL CULTURE (3) Study of political culture in the United States. Prerequisite: 3 credits of American Studies, Political Science, Public Policy, or Sociology

AMSTD 363 AMERICAN MUSIC (3) A survey of all styles and types of American music from 1620 to the present. Prerequisite: 3 credits of AMSTD and MUSIC

AMSTD 400 EARLY AMERICA TO 1765 (3) American society and culture in the colonial period. Prerequisite: 6 credits in American Studies or History

AMSTD 401 REVOLUTION AND EARLY REPUBLIC, 1765–1815 (3) American society and culture during the period of the Revolution and the Early Republic. Prerequisite: 6 credits of American Studies or History

AMSTD 402 ANTEBELLUM AND CIVIL WAR ERA, 1815–1876 (3) Social and cultural conditions, sectional rivalry, political crises, warfare, and Reconstruction from 1815 to 1876. Prerequisite: 6 credits in American Studies or History

AMSTD 404 COLD WAR AMERICA (3) Examination of social and cultural currents in American life from World War II to 1990. Prerequisite: 6 credits of American Studies or History

AMSTD 405 INDUSTRIAL AMERICA, 1876–1940 (3) An analysis of American politics, literature, society, and economics from the 1870s to World War II. Prerequisite: 6 credits of American Studies or History

AMSTD 406 CONTEMPORARY AMERICA (3) A study of the historic and cultural currents of life in the United States during the recent past. Prerequisite: HIST 021 or 6 credits of American Studies

AMSTD 412 AMERICAN ERAS (3 per semester) Examination in depth of various and distinctive American time periods; subtitle expresses specific content. (May be repeated for credit.) Prerequisite: 6 credits of American Studies or History

AMSTD 417 AMERICAN BELIEFS AND MYTHS (3 per semester) A study of symbols, beliefs, and myths in the American experience; subtitles express specific content. (May be repeated for credit.) Prerequisite: 6 credits of American Studies

AMSTD 430 (GI) (WOMST) WOMEN IN AMERICAN SOCIETY (3) A historical study of women's roles and experiences in the United States. Prerequisite: 6 credits of American Studies, Sociology, or Women's Studies

AMSTD 431 NATIONAL CHARACTER (3) An examination of the characteristics of the American people and other national groups. Prerequisite: AMSTD 301 or 6 credits in American Studies

AMSTD 435 AMERICANS AT WORK (3) A study of occupational and organizational cultures in America. Prerequisite: 6 credits in American Studies or Labor and Industrial Relations, or Sociology

AMSTD 439 AMERICAN REGIONS (3 per semester) Examination in depth of various and distinctive American regions; subtitle expresses specific content. (May be repeated for credit.) Prerequisite: 6 credits of American Studies or Geography

AMSTD 441 (KINES) HISTORY OF SPORT IN AMERICAN SOCIETY (3) Background, establishment, and growth of sport in America from colonial times to the present. Prerequisite: KINES 141 or 3 credits of United States history

AMSTD 448 (ANTH) ETHNOGRAPHY OF THE UNITED STATES (3) Ethnographic descriptions of various dimensions of life in the United States. Prerequisite: ANTH 045

AMSTD 460 AMERICAN ART AND ARCHITECTURE OF THE SEVENTEENTH AND EIGHTEENTH CENTURIES (3) Survey of American painting, sculpture, decorative arts, and architecture of seventeenth and eighteenth centuries with special emphasis on non-British cultures.

AMSTD 461 AMERICAN ART AND ARCHITECTURE OF THE NINETEENTH CENTURY (3) A survey of American painting, sculpture, decorative arts, and architecture of the nineteenth century.

AMSTD 462 AMERICAN ART AND ARCHITECTURE OF THE 20TH CENTURY (3) A survey of American painting, sculpture, decorative arts, and architecture of the twentieth century.

AMSTD 472 (ENGL) TOPICS IN AMERICAN LITERATURE (3 per semester) Focused study of a particular genre, theme, or problem in American literature. (May be repeated for credit.) Prerequisite: 6 credits of ENGL, ENLSH, or LIT

AMSTD 475 (GI) (ENGL) BLACK AMERICAN WRITERS (3 per semester, maximum of 6) A particular

genre or historical period in the development of Black American literature. Prerequisite: ENGL 015 or ENGL 030
AMSTD 476 (ENGL;WOMST) AMERICAN WOMEN WRITERS (3) A study of selected American women writers. Prerequisite: 6 credits of ENGL, ENLSH, or LIT
AMSTD 479 AMERICAN EXPRESSIVE FORMS (3 per semester) Examination in depth of various and distinctive American expressive forms; subtitle expresses specific content. (May be repeated for credit.) Prerequisite: 6 credits in American Studies
AMSTD 480 MUSEUM STUDIES (3 per semester) An introduction to the basic purposes, philosophies, and functions of a museum, with emphasis on the problems of museum administration. (May be repeated for credit.) Prerequisite: 6 credits in American Studies
AMSTD 481 HISTORIC PRESERVATION (3) A study of preservation practices and programs in America. Prerequisite: 6 credits in American Studies
AMSTD 482 PUBLIC HERITAGE (3 per semester) A study of public heritage practices and programs in America. (May be repeated for credit.) Prerequisite: 6 credits in American Studies
AMSTD 483 ORAL HISTORY (3) A study of oral history techniques and issues in America. Prerequisite: 6 credits in American Studies
AMSTD 484 ARCHIVES AND RECORDS MANAGEMENT (3) A study of archives and records management in America. Prerequisite: 6 credits in American Studies
AMSTD 494 RESEARCH PROJECT (1–12)
AMSTD 495 INTERNSHIP (1–6) Supervised internship for undergraduate or graduate American Studies majors at a museum or another cultural, historical, or arts agency. Prerequisite: senior-level status for undergraduate students; 18 credits of course work in major for graduate students; approval of program required
AMSTD 496 INDEPENDENT STUDIES (1–18)
AMSTD 497 SPECIAL TOPICS (1–9)

ANIMAL SCIENCE (AN SC)

College of Agricultural Sciences
AN SC 001 ANIMAL SCIENCE (4) Scope of animal and poultry science; genetic, physiological, nutritional, and health factors in food production.
AN SC 037 HORSE AND MAN (2) Relationship of horse and man; development of breeds; use, adaptability, and economic importance of the horse in today's society.
AN SC 097 SPECIAL TOPICS (1–9)
AN SC 098 SPECIAL TOPICS (1–9)
AN SC 100 ANIMAL AGRICULTURE (3) Magnitude, importance, and complexity of the beef, dairy, horse, poultry, sheep, and swine industries, with particular emphasis on Pennsylvania agriculture.
AN SC 110S CONTEMPORARY ISSUES IN ANIMAL BIOTECHNOLOGY AND SOCIETY (1) An introductory survey of animal biotechnology in society, the role for biotechnology and how it will benefit society.
AN SC 197 SPECIAL TOPICS (1–9)
AN SC 198 SPECIAL TOPICS (1–9)
AN SC 207 (FD SC) ANIMAL PRODUCTS TECHNOLOGY (2) Composition, safety, palatability, preservation, and processing of foods from animals, impact of animal production, and handling practices on product properties.
AN SC 208 (FD SC) ANIMAL PRODUCTS TECHNOLOGY LABORATORY (1) Harvesting and processing of foods from animals; hands-on and demonstration exercises; industry procedures for processing meat, milk, and egg products. Prerequisite: or concurrent: AN SC 207
AN SC 211 INTRODUCTION TO AVIAN BIOLOGY (3) Introduces the biology of birds; lectures, laboratories on anatomy and function, incubation, breeding, disease control, management techniques, and student projects. Prerequisite: OR CONCURRENT: BIOL 110; OR BIOL 011, BIOL 012
AN SC 213 INTRODUCTION TO ANIMAL BIOTECHNOLOGY (3) An introduction to the multidisciplinary area of animal biotechnology: from molecular, genetic, genomics and development issues to their technological applications. Prerequisite: AN SC 001, BIOL 110, CHEM 012 CHEM 013
AN SC 290W CAREERS IN ANIMAL AGRICULTURE (1) A description and analysis of career opportunities in the animal sciences and allied industries.
AN SC 296 INDEPENDENT STUDIES (1–18)
AN SC 297 SPECIAL TOPICS (1–9)
AN SC 298 SPECIAL TOPICS (1–9)
AN SC 300 (GN) INTEGRATED ANIMAL BIOLOGY (3) An integrated study of the biology of domestic animal growth and the underlying cellular, endocrine and immune systems involved. Prerequisite: BIOL 011 and BIOL 012, or BIOL 110; at least third-semester standing
AN SC 301 PRINCIPLES OF ANIMAL NUTRITION (3) Nutrients and their metabolism; the nutritional requirements of livestock; the nutritional value of various feeds; principles of ration formulation. Prerequisite: 3 credits in biochemistry or organic chemistry
AN SC 305 COMPANION ANIMAL NUTRITION (3) Principles of care and nutrition and contemporary importance of companion animals with emphasis on canine and feline species. Prerequisite: AN SC 001
AN SC 306 SWINE PRODUCTION AND MANAGEMENT (3) Application of the principles of enterprise and facility development, operations management, quality control, public relations, marketing for the efficient operation of a swine production business. Prerequisite: AN SC 001

AN SC 308 SHEEP AND GOAT PRODUCTION AND MANAGEMENT (3) Application of principles of nutrition, breeding, physiology, health, facilities, marketing, and product development, to animal production agriculture. Prerequisite: AN SC 001

AN SC 309 BEEF CATTLE PRODUCTION AND MANAGEMENT (3) Application of principles of nutrition, breeding, physiology, health, facilities, and marketing to produce and manage beef efficiently. Prerequisite: AN SC 001

AN SC 310 DAIRY CATTLE PRODUCTION AND MANAGEMENT (3) Principles of dairy management including the dairy industry and control points associated with nutrition, genetics, lactation, reproduction, and housing. Prerequisite: AN SC 001

AN SC 311 POULTRY PRODUCTION AND MANAGEMENT (3) The application of fundamental concepts and preparation for careers in the economically integrated commercial poultry industry. Prerequisite: AN SC 001

AN SC 314 LABORATORY METHODS IN RODENT RESEARCH (2) Application of methods and techniques in small animal research including handling, necropsy procedures; histology and molecular methods including genotying. Prerequisite: AN SC 001, AN SC 213

AN SC 317 HORSE HANDLING AND TRAINING (3) Responses of horses to various stimuli during the training period. Laboratory exercises involve extensive practice with young horses. Prerequisite: AN SC 327 and approved level of horsemanship

AN SC 322 PRINCIPLES OF ANIMAL BREEDING (3) The fundamental principles of genetics as applied to breeding farm animals.

AN SC 324 VALUE DETERMINATION OF MEAT ANIMALS (3) Live animal and carcass evaluation of cattle, sheep, and swine to determine value of market animals and meat products.

AN SC 327 HORSE PRODUCTION AND MANAGEMENT (3) Principles of selection, breeding, feeding, management, and marketing of horses; emphasis on light horses. Prerequisite: AN SC 001

AN SC 331W APPLIED PHYSIOLOGY OF REPRODUCTION IN FARM ANIMALS (3) Physiological principles controlling reproductive patterns of cattle, horses, sheep, and swine; factors affecting fertility and methods for improving reproductive efficiency. Prerequisite: AN SC 001; 3 credits of physiology

AN SC 395 ANIMAL SCIENCE INTERNSHIP (1–12) Supervised field experience and study related to the student's major professional interest. Written and oral critique of activity required. Prerequisite: Animal Sciences majors; 6 credits in major plus approval of proposed assignment by instructor prior to advance registration deadline in semester preceding the semester in which the assignment is to be completed

AN SC 397 SPECIAL TOPICS (1–9)

AN SC 398 SPECIAL TOPICS (1–9)

AN SC 400 APPLICATION OF MANAGEMENT PRINCIPLES (1) Students will learn to apply business management skills to the animal production environment through interactive discussions and assignments. Prerequisite: seventh-semester standing

AN SC 405 ADVANCED CANINE NUTRITION AND MANAGEMENT (3) Application of biological principles to the care and nutrition of dogs; interactive discussions of contemporary nutrition and management issues. Prerequisite: AN SC 305 and AN SC 400; or permission of program

AN SC 406 ADVANCED SWINE PRODUCTION (1) Application of scientific and business principles to practical swine production management using case studies. Prerequisite: AN SC 306. Prerequisite or concurrent: AN SC 400

AN SC 407 ADVANCED HORSE MANAGEMENT (3) Detailed study of anatomy and physiology of the horse as related to nutrition, reproduction, athletic ability, unsoundness and control of diseases and parasites. Detailed discussion of management practices, facility design and contemporary issues. Prerequisite: AN SC 327, AN SC 400

AN SC 409 ADVANCED BEEF CATTLE, SHEEP, AND GOAT MANAGEMENT (2) Application of scientific and business principles to practical beef cattle, sheep, and goat management using case studies. Prerequisite: AN SC 308 or AN SC 309; AN SC 400

AN SC 410 ADVANCED DAIRY HERD MANAGEMENT (4) Application of dairy herd management principles using case studies and actual dairy farm situations. Prerequisite: AN SC 310. Prerequisite or concurrent: AN SC 400

AN SC 411 ADVANCED POULTRY MANAGEMENT (2) Students will be required to seek the solutions to problems and to make management decisions using a case study format. Prerequisite: AN SC 311. Prerequisite or concurrent: AN SC 400

AN SC 413 TRANSGENIC BIOLOGY (3) The principles and concepts used to generate genetically engineered animals by pronuclear, knockout, and cloning methods; and applied biotechnology applications. Prerequisite: a course in Molecular Biology and/or Biochemistry and/or Genetics

AN SC 414 COMPREHENSIVE ANIMAL BIOTECHNOLOGY (3) A comprehensive review of the multidisciplinary area of animal biotechnology examining historical developments, current progress, and future directions. Prerequisite: 3 credits in molecular biology, genomics, genetics, or biotechnology courses

AN SC 417 HORSE JUDGING (2) Evaluation and selection of halter and performance horses, and presentation of oral reasons.

AN SC 418 (AGECO;SOILS) NUTRIENT MANAGEMENT IN AGRICULTURAL SYSTEMS (3) Comprehensive review of nutrient flow in animal agricultural systems, environmental regulations, and environmental stewardship practices.

AN SC 420 ANIMAL NUTRITION AND FEED TECHNOLOGY (4) Feedstuff evaluation, quality control, handling, storage: life cycle feeding of beef cattle, dairy cattle, sheep, swine, horses, and poultry. Prerequisite: AN SC 301
AN SC 422 DAIRY CATTLE EVALUATION AND SELECTION (3) Methods used in evaluation of production and type traits and their role in selecting dairy breeding stock domestically and internationally. Prerequisite: AN SC 322
AN SC 423 COMPARATIVE PHYSIOLOGY OF DOMESTIC ANIMALS (3) A comparative approach to understanding body function in domesticated avian and mammalian species. Prerequisite: BIOL 110
AN SC 424 LIVESTOCK BREEDING EVALUATION AND SELECTION (3) Evaluation and selection of beef cattle, sheep, swine, and horses; critical analysis of performance records and genetic evaluations. Prerequisite: AN SC 324
AN SC 425 (V SC) PRINCIPLES OF AVIAN DISEASES (3) Principles of pathogenesis and control of diseases in poultry and other avian populations. Case material used where appropriate. Prerequisite: AN SC 001, BIOL 110, 4 credits in microbiology, and 3 credits of anatomy and/or physiology
AN SC 426 ADVANCED JUDGING AND SELECTION (2 per semester, maximum of 4) Development of critical thinking and communication skills through evaluation and selection of animals and animal products. Prerequisite: AN SC 322
AN SC 427 MILK SECRETION (3) Development and physiology of the mammary gland and factors which affect the amount and composition of milk produced. Prerequisite: AN SC 001, 3 additional credits in dairy science
AN SC 431W PHYSIOLOGY OF MAMMALIAN REPRODUCTION (4) Physiological processes of reproduction in animals, including the use of current and emerging technologies. Prerequisite: 3 credits in animal physiology
AN SC 432 TECHNIQUES IN CATTLE REPRODUCTION (1) Demonstration and practice in estrus detection, inseminating techniques, pregnancy detection, embryo recovery and transfer methods. Prerequisite: or concurrent: AN SC 431W
AN SC 437 (AEE) EQUINE FACILITATED THERAPY (3) Equine Facilitated Therapy uses equine-related activities to contribute positively to the wellbeing of people with disabilities.
AN SC 442 QUANTITATIVE INHERITANCE AND ANIMAL BREEDING (3) Genes in populations: additive and nonadditive gene effects; selection and mating systems. Prerequisite: 3 credits in genetics and breeding; 3 credits in statistics
AN SC 447 APPLIED EQUINE BEHAVIOR (3) Theory and application of behavior principles as they apply to horses in free- running and domestic situations. Prerequisite: AN SC 001, AN SC 327, and fifth-semester standing; or fifth-semester standing and six credits in biology; or permisssion of the instructor
AN SC 450 DAIRY FARM MANAGEMENT SYSTEMS (3) Capstone course emphasizing integration of dairy farm management principles into whole farm systems. Prerequisite: AN SC 310, AN SC 400, AN SC 410
AN SC 490 ANIMAL SCIENCE COLLOQUIUM (1) Technical and practical topics having current interest and importance to the animal science student. Prerequisite: 6 credits in animal science
AN SC 499 (GI) FOREIGN STUDIES (1–12)
NOTE: Also see course listed under Animal Nutrition, Poultry Science, and Veterinary Science.

ANTHROPOLOGY (ANTH)

College of the Liberal Arts

ANTH 001 (GS;GI) INTRODUCTORY ANTHROPOLOGY (3) Prehistoric and traditional peoples and cultures; traditional customs and institutions compared with those of modern society.
ANTH 002 (GS) INTRODUCTION TO ARCHAEOLOGY (3) Survey of basic approaches used by archaeologists to interpret basic prehistoric human cultural patterns.
ANTH 008 (GS;GI) AZTECS, MAYAS, AND INCAS (3) Comparative survey of the development of the pre-Columbian Latin American civilizations.
ANTH 009 (GS) RISE OF CIVILIZATION IN THE OLD WORLD (3) Evolution of Old World complex societies, especially the first great civilizations of Mesopotamia, Egypt, China, and the Indus Valley.
ANTH 010 (J ST) MEDITERRAEAN PREHISTORY (3) Archaeology of the circum-mediterranean area, from the Middle Pleistocene through the third millennium B.C., emphasizing the evolution of regional cultures.
ANTH 011 (GS;GI) INTRODUCTORY NORTH AMERICAN ARCHAEOLOGY (3) Introduction to archaeology of the North American Indians; sites, methods, and results of research interpreted in cultural history.
ANTH 021 (GN) INTRODUCTORY BIOLOGICAL ANTHROPOLOGY (3) The role of human biology and evolution in culture, society, and behavior.
ANTH 040 BIOCULTURAL EVOLUTION (3) Examination of evolutionary models of the development of the human capacity for culture, and of culture as an adaptive mechanism.
ANTH 045 (GS;GI) CULTURAL ANTHROPOLOGY (3) Beginnings of human culture; economic life, society, government, religion, and art among traditional peoples.
ANTH 083S (GS) FIRST-YEAR SEMINAR IN ANTHROPOLOGY (3) This seminar introduces students to anthropology as a scientific discipline with ties to other social and natural sciences.
ANTH 146 (GS;GI) NORTH AMERICAN INDIANS (3) An introduction to the cultures of the indigenous peoples of North America, north of Mexico, and the effect of contact.
ANTH 152 HUNTERS AND GATHERERS (3) A comparative study of hunter/gatherer societies using both archaeological and ethnographic evidence.

ANTH 187 ANTHROPOLOGY FRESHMAN SEMINAR (3) The meaning and advantages of a Liberal Arts education in context of a specific discipline.
ANTH 197 SPECIAL TOPICS (1–9)
ANTH 199 (GI) FOREIGN STUDIES (1–12)
ANTH 241 PEOPLES AND CULTURES OF HIGHLAND NEW GUINEA (3) History, ecology, social, economic, religious and political systems of the aboriginal peoples and cultures of highland New Guinea. Prerequisite: ANTH 001 OR ANTH 045
ANTH 242 (GI) PEASANT SOCIETIES (3) A critical examination of anthropological apporaches to the study of peasantry around the globe. Prerequisite: ANTH 001 or ANTH 045
ANTH 285 (GS;GI) CULTURE CONTACT (3) Survey of changes in indigenous societies following contact with colonial powers. Prerequisite: ANTH 002, ANTH 045
ANTH 294 RESEARCH PROJECT (1–12)
ANTH 296 INDEPENDENT STUDIES (1–18)
ANTH 297 SPECIAL TOPICS (1–9)
ANTH 298 SPECIAL TOPICS (1–9)
ANTH 299 (GI) FOREIGN STUDIES (1–12)
ANTH 321W INTELLECTUAL BACKGROUND OF ARCHAEOLOGY (3) Introduction to primary sources on the development of archaeology as a scientific discipline. Prerequisite: ANTH 002, ANTH 045
ANTH 380 ANTHROPOLOGY MUSEUM STUDIES (3) Introduction to the history, significance, and operation of anthropology museums.
ANTH 395 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
ANTH 399 (GI) FOREIGN STUDIES (1–12)
ANTH 401 HUMAN EVOLUTION: THE MATERIAL EVIDENCE (3) Human origins as seen in the fossil record and comparative biology of humans and their primate relatives. Prerequisite: ANTH 021
ANTH 405 PRIMATOLOGY (3) Nonhuman primate origins, evolution, comparative physical and behavioral characteristics, ecological context, phylogeny and taxonomy; and their importance in anthropology. Prerequisite: ANTH 021
ANTH 406W PROBLEMS IN HUMAN EVOLUTION (3) Investigation of human evolution in terms of the history of ideas and contemporary research on genetic and evolutionary processes. Prerequisite: ANTH 021 or 3 credits in biology, 3 credits in statistics
ANTH 408 ANTHROPOLOGICAL DEMOGRAPHY (3) Analysis of demographic studies in traditional and very small populations. Prerequisite: 3 credits in anthropology
ANTH 409 QUANTITATIVE ANALYSIS OF MORPHOLOGICAL DATA (3) The application of morphometric methods to anthropological data: phenotypes of organisms, artifacts, and traits. Prerequisite: ANTH 002 or ANTH 021; STAT 200; 3 additional credits in anthropology
ANTH 410 OSTEOLOGY (3) Introduction to the systematic study of the human skeleton from an evolutionary developmental biological perspective. Prerequisite: 3 credits in anthropology, 3 credits in the biological sciences; or concurrent enrollment in ANTH 401 or ANTH 501
ANTH 411 FORENSIC ANTHROPOLOGY (4) An introduction to the field of forensic science, osteology, DNA analysis. Prerequisite: ANTH 002 or ANTH 021
ANTH 420 (J ST) ARCHAEOLOGY OF THE NEAR EAST (3) Culture of the Near East and India from Paleolithic times through the Bronze Age. Prerequisite: ANTH 008, ANTH 009, ANTH 011, or ANTH 012
ANTH 422 MESO-AMERICAN ARCHAEOLOGY AND ETHNOGRAPHY (3) Survey of ethnohistorical and ethnographic patterns of Meso-American society; origin and development of ancient civilization in Mexico, Guatemala, and Honduras. Prerequisite: ANTH 008, ANTH 009, ANTH 011, or ANTH 012
ANTH 423 THE EVOLUTION OF AMERICAN INDIAN CULTURE (3) Historic and archaeological sources used to trace American Indian lifestyles from the first immigrants to the period of Euro-American contact. Prerequisite: 3 credits in anthropology
ANTH 424 ANDEAN ETHNOLOGY AND ARCHAEOLOGY (3) Cultures of the Andes from earliest settlements to Inka Empire; includes discussion of life in modern Andean communities. Prerequisite: ANTH 002, ANTH 045
ANTH 428 ARCHAEOLOGICAL METHODS AND THEORY (3) Scientific methods as applied to archaeological data: evolution, ecology, diffusion, and cyclicism theory. Prerequisite: ANTH 007, ANTH 008, ANTH 009, ANTH 011, or ANTH 012
ANTH 440 SOUTH AMERICAN TRIBAL SOCIETIES (3) Ethnographic survey of tribal societies in South America. Special emphasis on non-Andean area.
ANTH 442 (GI) INDIANS AND PEASANTS OF MEXICO AND CENTRAL AMERICA (3) Indian culture and society in Mexico and Central America. Prerequisite: ANTH 001 or ANTH 045
ANTH 444 PRIMITIVE WARFARE (3) Critical overview of the ethnography and theory of primitive warfare. Prerequisite: ANTH 045; and ANTH 002 or ANTH 021
ANTH 445W ETHNOGRAPHIC FILM (3) Comparisons of written and visual ethnography; critical assessment of ethnographic film; cross-cultural variation. Prerequisite: ANTH 001 or ANTH 045
ANTH 447 PEOPLES AND CULTURES OF AFRICA (3) Ethnographic survey of peoples and cultures of Africa. Prerequisite: AAA S 110 or ANTH 045

ANTH 448 (AMSTD) ETHNOGRAPHY OF THE UNITED STATES (3) Ethnographic descriptions of various dimensions of life in the United States. Prerequisite: ANTH 045
ANTH 450 COMPARATIVE SOCIAL ORGANIZATION (3) Social structure and cultural change among nonliterate societies. Prerequisite: ANTH 045
ANTH 450W COMPARATIVE SOCIAL ORGANIZATION (3) Social structure and cultural change among nonliterate societies. Prerequisite: ANTH 045
ANTH 451 ECONOMIC ANTHROPOLOGY (3) Different approaches to the study of the economics of non-Western societies, emphasizing the interrelationships between noneconomic factors and economic behavior. Prerequisite: ANTH 045
ANTH 452 CRITICAL READINGS IN SOCIAL ORGANIZATION (3) Critical overview of approaches to kinship and social organization. Prerequisite: ANTH 045
ANTH 453 ANTHROPOLOGY OF RELIGION (3) Traditional and modern religions and historical and contemporary religious movements from an anthropological perspective. Prerequisite: ANTH 001 OR ANTH 045
ANTH 454 POLITICAL ANTHROPOLOGY (3) Comparative study of institutions which control force in nonstate societies.
ANTH 455 GLOBAL PROCESSES AND LOCAL SYSTEMS (3) Ethnographic, comparative, historic, evolutionary treatment of global economic, political, and cultural processes and their consequences for local systems. Prerequisite: ANTH 045
ANTH 456 CULTURAL ECOLOGY (3) Survey of the methods and concepts of cultural ecology, focusing on the interaction between cultural and geographical systems. Prerequisite: 3 credits in anthropology
ANTH 458 ETHNOGRAPHIC FIELD METHODS (3) Analysis of ethnographic methods used in studying different cultures. Prerequisite: ANTH 045
ANTH 459 APPLIED ANTHROPOLOGY (3) A survey of the development of applied anthropology and the current issues facing anthropologists working in non-academic settings. Prerequisite: ANTH 045
ANTH 460 (BIOL) HUMAN GENETICS (3) Gene mapping in humans; molecular basis of genetic disease; genomic structure; immunogenetics; and genetic evidence for human evolutionary history. Prerequisite: BIOL 230W or 3 credits in genetics
ANTH 460H (BIOL) HUMAN GENETICS (4) Gene mapping in humans; molecular basis of genetic disease; genomic structure; immunogenetics; and genetic evidence for human evolutionary history. Prerequisite: 3 credits in genetics, or ANTH 021, or BIOL 222, or BIOL 230W; and 3 credits in statistics
ANTH 462 THE BIOMETRY OF HUMAN REPRODUCTION (3) A survey of statistical studies of human fertility and reproductive biology. Prerequisite: BIOL 341, STAT 451
ANTH 463 QUANTITATIVE ANALYSIS OF MORPHOLOGICAL DATA (3) The application of morphometric methods to anthropological data: phenotypes of organisms, artifacts, and traits. Prerequisite: ANTH 002 or ANTH 021; STAT 200; 3 additional credits in anthropology
ANTH 464 (BIOL) SOCIOBIOLOGY (3) The study of the adaptive function of social behavior, the comparative analysis of social organization, and the ecology of sociality. Prerequisite: 6 credits in biology or anthropology
ANTH 465H FIFTEEN GREAT BIOLOGY PAPERS (3) Reading and discussion of the most influential papers in the history of biology that illustrate exceptional insight and elegant reasoning. Prerequisite: ANTH 021 or 3 credits in evolutionary biology or genetics, and 3 credits in statistics
ANTH 466 THE SKULL (3) Survey of the mammalian skull from many perspectives including evolution, development, anatomy, function, and variability of the skull. Prerequisite: ANTH 021
ANTH 470H OUR PLACE IN NATURE (3) An evolutionary and genetic consideration of our understanding of human beings as a part of the natural world. Prerequisite: 3 credits each in genetics, evolutionary biology, and statistics
ANTH 473 GENETICS OF HUMAN DISEASE (3) Human genetic variation and evolution as reflected in disease patterns; methods for assessing and quantifying such disease patterns. Prerequisite: 3 credits in statistics; 3 credits in biology
ANTH 473W GENETICS OF HUMAN DISEASE (3) Human genetic variation and evolution as reflected in disease patterns; methods for assessing and quantifying such disease patterns. Prerequisite: ANTH 021 or 3 credits in biology; 3 credits in statistics
ANTH 474 ECOLOGY OF GENDER (3) Survey of the human biology and cultural ecology of gender. Prerequisite: ANTH 021 OR BIOL 101
ANTH 476W (WMNST) ANTHROPOLOGY OF GENDER (3) Cross-cultural construction of gender and sex roles; theories of gender construction; case studies and practical effects. Prerequisite: 3 credits in women's studies or anthropology
ANTH 492 INTERMEDIATE FIELD METHODS (3–6) On-site experience in collecting archaeological, behavioral, or biological data. Prerequisite: ANTH 002
ANTH 493 FIELD TECHNIQUES (3–6) Training in techniques involving analyses of archaeological, behavioral, or biological data. Prerequisite: ANTH 002
ANTH 494 RESEARCH PROJECT (1–12)
ANTH 495 INTERNSHIP (1–18)
ANTH 496 INDEPENDENT STUDIES (1–18)
ANTH 497, 498 SPECIAL TOPICS (1–9)

APPLIED LINGUISTICS (APLNG)

College of the Liberal Arts

APLNG 083S (GS;GI) FIRST-YEAR SEMINAR IN APPLIED LINGUISTICS (3) Introduction to the application of theories of language to cognition, culture, gender, society, and second language acquisition.

APLNG 297 SPECIAL TOPICS (1–9)

APLNG 410 TEACHING AMERICAN ENGLISH PRONUNCIATION (3) Study and application of principles of North American English phonetics and theories of teaching pronunciation.

APLNG 412 TEACHING SECOND LANGUAGE WRITING (3) This course provides opportunities for exploring various perspectives on theory, research, and pedagogial applications in second language writing.

APLNG 482W INTRODUCTION TO APPLIED LINGUISTICS (3) Application of theories of language to psycholinguistics, philosophy of language, anthropological linguistics, sociolinguistics, bi/multilingualism, second language acquisition and teaching. Prerequisite: LING 100

APLNG 484 DISCOURSE-FUNCTIONAL GRAMMAR (3) Develop a working knowledge of the structure of English and apply such knowledge to research and/or classroom situations.

APLNG 491 THEORY: SECOND LANGUAGE ACQUISITION (3) An investigation into current issues in the theoretical bases of second language acquisition. Prerequisite: basic course in linguistics

APLNG 493 TEACHING ENGLISH AS A SECOND LANGUAGE (3) Theory, research, and pedagogy that focus on the teaching of English to speakers of other languages in varied contexts.

APLNG 496 INDEPENDENT STUDIES (1–18)

APLNG 497 SPECIAL TOPICS (1–9)

ARABIC (ARAB)

College of the Liberal Arts

ARAB 001 ELEMENTARY MODERN STANDARD ARABIC I (4) Introduction to reading, writing, pronunciation, and aural comprehension of modern standard Arabic; simple grammatical forms; basic vocabulary.

ARAB 002 ELEMENTARY MODERN STANDARD ARABIC II (4) Continued audio-lingual practice in class and language laboratory of modern standard Arabic; continuation of grammar and vocabulary building. Prerequisite: ARAB 001

ARAB 003 INTERMEDIATE MODERN STANDARD ARABIC (4) Continued audio-lingual practice in class and language laboratory of modern standard Arabic; complex grammatical forms; vocabulary building principles. Prerequisite: ARAB 002

ARAB 097, 197, 297, 397, 497, 498 SPECIAL TOPICS (1–9)

ARAB 099, 199, 299, 399, 499 (GI) FOREIGN STUDIES (1–12)

ARAB 165 (HIST;RL ST) INTRODUCTION TO ISLAMIC CIVILIZATION (3) Islamic history, culture, and religious life c.600-1500 C.E.

ARAB 294, 494 RESEARCH PROJECT (1–12)

ARAB 295, 395 INTERNSHIP (1–18)

ARAB 296, 496 INDEPENDENT STUDIES (1–18)

ARCHITECTURAL ENGINEERING (A E)

College of Engineering

A E 097 SPECIAL TOPICS (1–9)

A E 124S ARCHITECTURAL ENGINEERING ORIENTATION (1) Introduction to architectural engineering; lectures and discussions with special reference to the relation of architectural engineering to the building industry.

A E 197 SPECIAL TOPICS (1–9)

A E 201INTRODUCTION TO STRUCTURES (2) Qualitative study, structural systems in architecture; analysis and synthesis of structure; experimental models.

A E 202 INTRODUCTION TO BUILDING MECHANICAL SYSTEMS (3) Introduction to thermal, psychrometric, energy and human comfort issues in buildings; building form and the natural environment; plumbing systems. Prerequisite: PHYS 213

A E 210 INTRODUCTION TO ARCHITECTURAL STRUCTURAL SYSTEMS (3) Qualitative study of architectural structural systems; historical development of structures; insights of structural analysis and synthesis; comparative structural types. Prerequisite: algebra, trigonometry

A E 211 INTRODUCTION TO ENVIRONMENTAL CONTROL SYSTEMS (3) Qualitative study of humans in macro- and micro-architectural environmental systems.

A E 221 ARCHITECTURAL BUILDING MATERIALS (2) The structural and architectural use of building materials; commercial standardization, classification, and description as encountered in the building trades.

A E 222 WORKING DRAWINGS (3) Materials and methods of construction used in residences, and preparation of working drawings for a small building. Prerequisite: E G 130 or ED&G 100

A E 297 SPECIAL TOPICS (1–9)

A E 308 INTRODUCTION TO STRUCTURAL ANALYSIS (4) Algebraic and graphical methods of analysis of determinate members, deflections; introduction to indeterminate methods. Prerequisite: E MCH 011, E MCH 013

A E 309 ARCHITECTURAL ACOUSTICS (2) Acoustical design for good hearing conditions and noise control; construction details, materials, acoustical properties of room shapes; sound absorption, transmission. Prerequisite: A E 221, A E 222, PHYS 213

A E 310 FUNDAMENTALS OF HEATING, VENTILATING, AND AIR CONDITIONING (3) Fundamental principles and engineering procedures for the design of heating, ventilating, and air-conditioning systems, including energy utilization and constraints. Prerequisite: or concurrent: A E 202, M E 023

A E 311 FUNDAMENTALS OF ELECTRICAL AND ILLUMINATION SYSTEMS FOR BUILDING (3) Fundamental principles, systems, and planning concepts for electrical and illumination systems in modern buildings. Prerequisite: or concurrent: E E 220, PHYS 212

A E 312 FUNDAMENTALS OF BUILDING CORE SYSTEMS (2) Fundamental principles and design practices for water, fire safety, signal, and transportation systems. Prerequisite: A E 202

A E 372 INTRODUCTION TO THE BUILDING INDUSTRY (3) Introduction to the building industry; owner, designer responsibilities; documents, bidding procedures; design-construct contracts; project management; insurance, labor relations. Prerequisite: sixth-semester standing in Architectural Engineering

A E 397 SPECIAL TOPICS (1–9)

A E 398 SPECIAL TOPICS (1–9)

A E 401 STRUCTURAL DESIGN OF BUILDINGS (3) Application of principles of engineering mechanics to layout, analysis, design, and detailing of structural elements in wood and steel of simple buildings. Prerequisite: A E 221, A E 222, A E 308

A E 402 STRUCTURAL DESIGN OF BUILDINGS (3) Plain and reinforced concrete; design analysis and detail of beams, slabs, columns, and walls. Prerequisite: A E 221, A E 222, A E 308

A E 403 STRUCTURAL DESIGN OF BUILDINGS (3) Continuation of A.E. 401. Advanced analysis, design, and detail of the structural elements in wood and steel. Prerequisite: A E 401, A E 430

A E 421 ARCHITECTURAL STRUCTURAL SYSTEMS I (3) Qualitative and quantitative analysis and design of architectural structures, force flow; structure configurations; measurement and experiments; design studio critique. Prerequisite: A E 210, 3 credits in mathematics

A E 422 ARCHITECTURAL STRUCTURAL SYSTEMS II (3) Continuation of A E 421, with emphasis on structural configuration and construction assemblies. Prerequisite: A E 421

A E 423 ARCHITECTURAL STRUCTURAL SYSTEMS III (3) Continuation of A E 422, with emphasis on individual studies and research; design and comparative structure types in buildings. Prerequisite: A E 422

A E 424 ENVIRONMENTAL CONTROL SYSTEMS I (3) Fundamental principles and applications of environmental systems in buildings. Prerequisite: A E 211

A E 425 ENVIRONMENTAL CONTROL SYSTEMS II (3) Continuation of A E 424, with emphasis on analysis, design and comparison of specific environmental systems in buildings. Prerequisite: A E 424

A E 430 INDETERMINATE STRUCTURES (3) Classical methods of analysis for beams, frames, arches, and secondary stresses as applied to buildings; introduction to modern methods. Prerequisite: A E 308

A E 431 STRUCTURAL DESIGN OF BUILDINGS (3) Continuation of A.E. 402. Advanced analysis, design, and detail of concrete masonry, prestressed and reinforced concrete. Prerequisite: A E 402, A E 430

A E 439 MODERN STRUCTURAL SYSTEMS (3) Analysis and design of building structures of unusual types. Prerequisite: A E 401, A E 402, A E 430

A E 441W INTEGRATION OF ARCHITECTURAL ENGINEERING SYSTEMS (3) Analysis and synthesis of systems—structural, mechanical, electrical, sanitary, construction—considering interrelationship in performance, economics of total systems, computer programs. Prerequisite: A E 309, A E 310, A E 311, A E 401, A E 402

A E 444 MICRO CADD APPLICATIONS FOR BUILDINGS (3) Application of microcomputer based CADD systems to architectural engineering problems including graphics, system customization, and AI programming techniques. Prerequisite: A E 222; CMPSC 201C or CMPSC 201F

A E 454 ADVANCED HEATING, VENTILATING, AND AIR CONDITIONING (3) Engineering design and performance analysis procedures for complex commercial building systems, including energy conservation techniques; design project. Prerequisite: A E 310

A E 455 ADVANCED HEATING, VENTILATING, AND AIR CONDITIONING SYSTEM DESIGN (3) Design of several different systems for a course project building; control strategy; economic comparisons using life-cycle cost techniques. Prerequisite: A E 454

A E 456 SOLAR ENERGY BUILDING SYSTEM DESIGN (3) Solar radiation, collectors, and thermal storage; design and analysis of a heating system using system-simulation computer program. Prerequisite: seventh-semester standing in Engineering

A E 458 ADVANCED ARCHITECTURAL ACOUSTICS AND NOISE CONTROL (3) Advanced consideration of noise control in buildings; ventilating system noise and vibration; acoustic design variables. Prerequisite: A E 309

A E 461 BASIC THEORY OF BUILDING ILLUMINATION (3) Theory, application of lighting in buildings; electric light sources, related equipment circuitry; illumination design procedures; daylighting. Prerequisite: A E 311

A E 464 ADVANCED ARCHITECTURAL ILLUMINATION SYSTEMS DESIGN (3) Advanced work in daylighting, light distributions, interflections, vision, and color; application of theory of operation of motors, transformers, and associated devices. Prerequisite: A E 461, seventh-semester standing in Architectural Engineering

A E 466 COMPUTER AIDED LIGHTING DESIGN AND ANALYSIS (3) Design and analysis of lighting for outdoor, sports, floodlighting, and interior applications; economic analysis, modeling algorithms; design criteria. Prerequisite: A E 461

A E 467 ADVANCED BUILDING ELECTRICAL SYSTEM DESIGN (3) Design of electrical systems for commercial and industrial facilities emphasizing design practice and integration with codes and standards. Prerequisite: A E 311, E E 220

A E 470 RESIDENTIAL BUILDING DESIGN AND CONSTRUCTION (3) Managerial aspects; architectural and code considerations; cost estimating, design, and construction of structural, plumbing, HVAC, and electrical systems. Prerequisite: A E 372 or C E 331; seventh-semester standing in Architectural Engineering or Civil Engineering

A E 471 BUILDING CONSTRUCTION ASSEMBLIES (3) Performance characteristics and special problems associated with assembly- erection procedures for building construction materials and components; case studies of failures. Prerequisite: A E 221, A E 222

A E 472 BUILDING CONSTRUCTION MANAGEMENT (3) Components of building industry; related responsibilities; building trades relationships; building construction contracts and bidding procedures; building construction sequences; industrialization; projects. Prerequisite: seventh-semester standing in Architectural Engineering

A E 473 BUILDING CONSTRUCTION MANAGEMENT (3) Construction sequences, CPM; bonds, liens, arbitration; subcontract bidding analysis and preparation; financial and legal problems; industrialization of buildings. Prerequisite: A E 372

A E 474 BUILDING CONSTRUCTION ESTIMATING (3) Construction estimating and cost engineering fundamentals; quantity take off; pricing, bid preparation; estimating, cost accounting by computer. Prerequisite: A E 372

A E 475 BUILDING CONSTRUCTION ENGINEERING I (3) Project planning, supervision, inspection of architectural and structural operations in major buildings; mobilization, coordination of trades; offsite testing and fabrication. Prerequisite: A E 401 or A E 402

A E 476 BUILDING CONSTRUCTION ENGINEERING II (3) Construction of mechanical and electrical systems in major buildings; fire protection, sound control, elevatoring; trade coordination; manufacturers' developments; computer application. Prerequisite: A E 309, A E 475

A E 477 SENIOR BUILDING CONSTRUCTION PROJECT (3) Investigation of current or completed major construction project; studies of industry management problems; formal project presentation, critique. Prerequisite: A E 475, A E 476

A E 480W COMPREHENSIVE ARCHITECTURAL ENGINEERING SENIOR PROJECT I (4) Emphasis on investigation of the construction engineering aspects of the building and building systems. Prerequisite: ARCH 441, fifth-year Architectural Engineering standing in major area of emphasis

A E 481W COMPREHENSIVE ARCHITECTURAL ENGINEERING SENIOR PROJECT I (4) Preparation of project plan, building selection, preliminary investigation of building systems and criteria; emphasis on building structural or environ- mental systems. Prerequisite: ARCH 441, fifth-year Architectural Engineering standing in major area of emphasis

A E 482A COMPREHENSIVE ARCHITECTURAL ENGINEERING SENIOR PROJECT II (4) Continuation of A E 481W, B, C. Engineering analysis of building systems; emphasis on analysis and design of building structural systems. Prerequisite: A E 481W

A E 482B COMPREHENSIVE ARCHITECTURAL ENGINEERING SENIOR PROJECT II (4) Continuation of A E 481W, B, C. Engineering analysis of building systems; emphasis on analysis and design of building environmental systems. Prerequisite: A E 481W

A E 482C COMPREHENSIVE ARCHITECTURAL ENGINEERING SENIOR PROJECT II (4) Continuation of A E 481W, B, C. Engineering analysis of building systems; emphasis on analysis of construction engineering and constructability interactions of the building systems. Prerequisite: A E 480W

A E 486 PROFESSIONAL ENGINEERING PRACTICE (3) A study of the influences which affect the practice of architectural engineering, particularly codes, ethics, legal considerations, and contract documents. Prerequisite: seventh-semester standing

A E 496 INDEPENDENT STUDIES (1–18)

A E 497, 498 SPECIAL TOPICS (1–9)

ARCHITECTURAL ENGINEERING TECHNOLOGY (AE T)

College of Engineering

AE T 101 BUILDING MATERIALS (3) Structural and architectural use of building materials and construction assemblies.

AE T 102 METHODS OF CONSTRUCTION (3) Materials and methods of construction used in buildings, as expressed in drawings. Prerequisite: AE T 101, EG T 101, EG T 102

AE T 103 PLUMBING AND FIRE PROTECTION (3) Layout of plumbing and fire protection in buildings to meet code and usage requirements. Prerequisite: or concurrent: AE T 102

AE T 113 SITE PLANNING (2) Energy conservation through optimum site utilization, contours, cut and fill calculations, storm drainage, spot grading, and finish grading.

AE T 121 INTRODUCTION TO BUILDING ENVIRONMENTAL SYSTEMS (2) Introduction to building environmental systems technology terminology, concepts, and the design process.

AE T 197 SPECIAL TOPICS (1–9)

AE T 204 HEATING, VENTILATING, AND AIR CONDITIONING LAYOUT (3) Fundamental calculations and layout of systems in buildings. Prerequisite: AE T 103. PREREQUISITE OR CONCURRENT: AE T 102

AE T 206 ARCHITECTURAL PRESENTATION (2) Visual communication through architectural presentation drawings. Line, value, color, and composition. Prerequisite: E G 001 or E G 003
AE T 207 ADVANCED CONSTRUCTION METHODS (3) Integration of materials and systems in working drawings. Prerequisite: fourth-semester standing
AE T 210 ARCHITECTURAL ENGINEERING OFFICE PRACTICE (3) Procedures involved in production of contract documents, both drawings and specifications. Prerequisite: fourth-semester standing
AE T 210W ARCHITECTURAL ENGINEERING OFFICE PRACTICE USING WRITING SKILLS (3) Concepts, procedures, and writing-intensive activities to properly prepare site observation reports, cost estimates, contractual conditions, and outline and technical specification. Prerequisite: fourth-semester standing.
AE T 212 BUILDING LIGHTING AND ELECTRICAL LAYOUT (3) Layout of lighting and electrical distribution in buildings.
AE T 214 STEEL CONSTRUCTION (3) Strength of materials as applied to the design of simple steel structures. Prerequisite: AE T 102, MCH T 111
AE T 215 CONCRETE CONSTRUCTION (3) Fundamentals of design and construction of reinforced concrete structures. Prerequisite: AE T 102, MCH T 111
AE T 227 LIQUID HEATING AND COOLING SYSTEMS (3) Water, steam, and refrigerant systems and components; pumps and piping; heat exchangers; fluid and component selection; power and controls. Prerequisite: AE T 121, ME T 281
AE T 228 AIR HEATING, COOLING, AND VENTILATING SYSTEMS (3) Air systems and distribution components; fans and ductwork; heat exchange coils; dampers and controls; residential fired equipment operation. Concurrent: AE T 227
AE T 229 ANALYSIS OF BUILDING ENVIRONMENTAL SYSTEMS (3) Comprehensive analysis and application of building environmental systems with focus on selected areas; calculation and layout; computer modeling of systems. Prerequisite: fourth-semester standing
AE T 296 INDEPENDENT STUDIES (1–18)
AE T 297, 298 SPECIAL TOPICS (1–9)

ARCHITECTURE (ARCH)

College of Arts and Architecture
ARCH 098 SPECIAL TOPICS (1–15)
ARCH 099 (GI) FOREIGN STUDIES—ARCHITECTURE (1–15)
ARCH 101 INTRODUCTION TO ARCHITECTURE STUDIO (3) Basic concepts/methods of architectural design; introduction/exploration of techniques of architectural communication/representation; structural, functional, and aesthetic dimensions of architecture are examined.
ARCH 110 DESIGN AND PLANNING THEORY I (3) Introduction to central concepts and fundamental issues underlying architectural and planning decisions, processes, and experiences. Concurrent: ARCH 121, ARCH 131
ARCH 111 DESIGN AND PLANNING THEORY II (3) Investigation of the design process on different scales; study of current architectural statements and the variety of determinant issues which they reflect. Prerequisite: ARCH 110
ARCH 121 VISUAL COMMUNICATIONS I (2) Abstract, symbolic, and representation of systems of communications. Development of visual and graphic skills and techniques. Prerequisite: FIRST SEMESTER STANDING IN THE ARCHITECTURE CURRICULUM Concurrent: ARCH 131
ARCH 122 VISUAL COMMUNICATIONS II (2) Abstract, symbolic, and representation of systems of communications. Development of visual and graphic skills and techniques. Prerequisite: ARCH 121, SECOND SEMESTER STANDING IN THE ARCHITECTURE CURRICULUM Concurrent: ARCH 132
ARCH 130A BASIC DESIGN AND RESEARCH I (3–6) Multidimensional design and perceptual development. Formulation of abstracted concepts and logical visual models. Prerequisite: Architectural Engineering majors only
ARCH 131S BASIC DESIGN AND RESEARCH I (3) Multidimensional design and perceptual development; formulation of abstracted concepts and logical visual models. Prerequisite: first-semester standing in the Architecture curriculum Concurrent: ARCH 121
ARCH 132 BASIC DESIGN AND RESEARCH II (3) Multidimensional design and perceptual development; formulation of abstracted concepts and logical visual models. Prerequisite: first-year standing in Architecture curriculum Concurrent: ARCH 122
ARCH 198 SPECIAL TOPICS (1–15)
ARCH 199 (GI) FOREIGN STUDIES—ARCHITECTURE (1–15) Individual or group instruction conducted in a foreign country.
ARCH 203 MATERIALS AND BUILDING CONSTRUCTION I (3) Instruction in the design and construction of buildings utilizing wood and steel. Prerequisite: third-semester standing in the Architecture curriculum
ARCH 204 MATERIALS AND BUILDING CONSTRUCTION II (3) This course will continue the presentations of ARCH 203, with a focus on concrete and masonry materials. Prerequisite: ARCH 203, fourth-semester standing in the Architecture curriculum
ARCH 210 (GA) CONTEMPORARY DESIGN AND PLANNING THEORIES (3) Central concepts, fundamental values, philosophy, and processes leading to the design and planning of buildings and man-made environments.

ARCH 211 (GA) CONTEMPORARY DESIGN AND PLANNING THEORIES II (3) Continuation of ARCH 210, with an in-depth analysis and study of significant and current environmental constructs and issues. Prerequisite: ARCH 210
ARCH 231 BASIC DESIGN AND RESEARCH III (5) Design of limited environments within defined constraints. Prerequisite: ARCH 132, second-year standing in Architecture curriculum
ARCH 232 BASIC DESIGN AND RESEARCH IV (5) Design of limited environments within defined constraints. Prerequisite: ARCH 231, second-year standing in Architecture curriculum
ARCH 281 COMPUTER APPLICATIONS IN ARCHITECTURAL DESIGN (3) Introductory course in computer applications, with an emphasis on architectural graphical output. Prerequisite: algebra, trigonometry, and 3 additional credits in higher mathematics
ARCH 296 INDEPENDENT STUDIES (1–18)
ARCH 297 SPECIAL TOPICS (1–9)
ARCH 298 SPECIAL TOPICS (1–15)
ARCH 299 (GI) FOREIGN STUDIES—ARCHITECTURE (1–15) Individual or group instruction conducted in a foreign country.
ARCH 311W ARCHITECTURAL AND PLANNING THEORIES (3) Architectural theory course with a strong focus on the reading and writing of essays about architecture and related fields. Prerequisite: ARCH 111, fifth-semester standing in the Architecture curriculum
ARCH 311Z (3)
ARCH 315 (GA) ANALYSIS OF HUMAN SETTLEMENTS: VILLAGES (3) Analysis of the origin and evolution of traditional, tribal, and communal village (type) settlements and nomadic societies through the present.
ARCH 316 (GA) ANALYSIS OF HUMAN SETTLEMENTS: CITIES (3) Analysis of the interrelated factors which determined and shaped the various types of early cities through the nineteenth century.
ARCH 331 DESIGN-RESEARCH I (6) Development of the design process through organizational methodologies, based on physical, functional, and social-behavioral determinants. Prerequisite: ARCH 232, faculty review, third-year standing in Architecture curriculum
ARCH 332 DESIGN-RESEARCH II (6) Development of the design process through organizational methodologies, based on physical, functional, and social-behavioral determinants. Prerequisite: ARCH 331, third-year standing in Architecture curriculum
ARCH 395 ARCHITECTURE WORK STUDY (6) Off-campus, non-group instruction under the direction of approved professionals in the field. Architecture majors only.
ARCH 398 SPECIAL TOPICS (1–15)
ARCH 431 DESIGN-RESEARCH III (6) Continuation of ARCH 331 and 332, with design and research in program option areas. Prerequisite: ARCH 332, fourth-year standing in Architecture curriculum
ARCH 432 DESIGN-RESEARCH IV (6) Continuation of ARCH 431, with design and research in program option areas. Prerequisite: ARCH 431, fourth-year standing in Architecture curriculum
ARCH 441 ARCHITECTURAL DESIGN ANALYSIS (4) Studies in principles and elements of design; planning for human use; the relationship of space to physical and social environment. Architectural Engineering majors only. Prerequisite: ARCH 130A
ARCH 442 ARCHITECTURAL DESIGN ANALYSIS (4) Continuation of ARCH 441, with emphasis on functional relationship of space, form, structure, and building groups. Architectural Engineering majors only. Prerequisite: ARCH 441
ARCH 443 ARCHITECTURAL DESIGN ANALYSIS INSPECTION TRIP (1) Faculty guided trip to metropolitan areas to investigate noteworthy architecture and building construction and to visit professional offices. Prerequisite: fourth-year architectural engineering majors first priority, others by faculty approval
ARCH 451 ARCHITECTURAL PROFESSIONAL PRACTICE (3) A study of architectural practice in today's society: education, registration, office practice, codes, standards, construction industry, contracts, and legal documents. Prerequisite: seventh-semester standing in Architecture curriculum
ARCH 480 TECHNICAL SYSTEMS INTEGRATION (3) Presentations of buildings' analyses from a multiplicity of viewpoints: architectural, spacial, environmental, mechanical, construction assembly. Prerequisite: fifth-year standing in the Architecture curriculum or approval by the instructor
ARCH 481 DIGITAL DESIGN MEDIA (3) Advanced course in digital modeling, rendering, animation and non-linear video for architectural investigations. Prerequisite: ARCH 281 or approval by instructor
ARCH 482 MICROCAD (3) Introductory course in Computer-Aided-Drafting applications with an emphasis on architectural office practices and architectural drawings production. Prerequisite: ARCH 281
ARCH 491 ARCHITECTURAL DESIGN-THESIS I (6) Problems in architectural planning and design; programming and/or implementation methodologies and applications for various environmental design scales. Prerequisite: ARCH 431 or ARCH 432, ARCH 499A, faculty review, fifth-year standing in the Architecture curriculum
ARCH 492 ARCHITECTURAL DESIGN-THESIS II (6) Continuation of ARCH 491 with concentration and specialization options. Prerequisite: ARCH 491, fifth-year standing in the Architecture curriculum
ARCH 496 INDEPENDENT STUDIES (1–18)
ARCH 497 SPECIAL TOPICS (1–9)
ARCH 498 SPECIAL TOPICS (1–15)
ARCH 499A (GI) FOREIGN STUDY—DESIGN RESEARCH II (6) Individual or group instruction conducted in a foreign country. Prerequisite: ARCH 332, fourth-year standing in the Architecture curriculum

ARCH 499B (GI) ARCHITECTURAL ANALYSIS (3) Comparative study of architectural elements and building types through on-site drawing/recording, measurement, sketching and decomposition activity. Prerequisite: fourth-year standing in the Architecture curriculum Concurrent: ARCH 499A, ARCH 499C
ARCH 499C (GI) URBAN STUDIES TOPICS (3) Focuses on architectural and urban design issues using Rome as a repository of examples and as a laboratory for experiments. Prerequisite: fourth-year standing in the Architecture curriculum Concurrent: ARCH 499A, ARCH 499B

ARMY (ARMY)

Intercollege, Reserve Officers' Training Corps
ARMY 101 U.S. ARMY ORGANIZATION AND FUNCTIONS (2) Introduction to U.S. Army and ROTC: their organization, missions and functions; customs and traditions; leadership laboratory.
ARMY 102 THE MILITARY PROFESSION: LEADERSHIP AND MANAGEMENT THEORY (2) Introduction to leadership techniques and basic management skills; leadership laboratory.
ARMY 203 ARMY OPERATIONS: TACTICS AND THE PRINCIPLES OF WAR (2) Organization and operation of Army units; fundamentals of unit tactics; leadership laboratory.
ARMY 204 LAND NAVIGATION: TOPOGRAPHIC MAPS AND ORIENTEERING (2) Military and topographic maps; methods of orienteering and land navigation; leadership laboratory.
OFFICER PREPARATORY COURSE
ARMY 301 ADVANCED PRINCIPLES OF LEADERSHIP AND MANAGEMENT (3) Principles of military leadership; military skills development; land navigation; physical fitness; leadership laboratory.
ARMY 302 ADVANCED PRINCIPLES OF MILITARY LEADERSHIP AND COMBAT OPERATIONS (3) Leadership in the field; principles of offense, defense, and patrolling; physical fitness, leadership laboratory. Prerequisite: ARMY 301
ARMY 304 ADVANCED CAMP Six weeks of Army field training to prepare cadets for commissioning as second lieutenants. Prerequisite: ARMY 301, ARMY 302
ARMY 401 ORGANIZATIONAL BEHAVIORS: INTERRELATIONSHIPS OF DIRECTING STAFFS AND STA FF FUNCTIONS (3) Leadership; command and staff functions; ethics and professionalism; military writing; leadership laboratory. Prerequisite: ARMY 302
ARMY 402 ARMY PERSONNEL MANAGEMENT AND LOGISTICS (3) Leadership; army personnel management; logistics system; personnel counseling; military justice; Soviet military; personal affairs; training management; army life; leadership laboratory. Prerequisite: ARMY 302
ARMY 496 INDEPENDENT STUDIES (1–9)

ART (ART)

College of Arts and Architecture
ART 001 (GA) INTRODUCTION TO THE VISUAL ARTS (3) Introduction to the media, elements, function, making, and meaning of visual arts today and in diverse historical and cultural contexts.
ART 002 (GA) INTERACTIVE LEARNING AND WEB-DESIGN (3) Introduce students to research on-line, preparing verbal, visual and other elements for presentation of outcomes and posting them to the Internet.
ART 003 (GA) VISUAL IMAGES ON THE WEB (3) Introduce students to using visual images for communication on the World Wide Web.
ART 010 (GA) INTRODUCTION TO VISUAL STUDIES (3) Introduction to visual studies; pictorial space and the principles of visual organization.
ART 017 (GA) INTRODUCTION TO METAL ARTS (3) Introduction for nonart majors to fundamental jewelry making and small-scale metalsmithing processes including fabrication, surface treatment, and finishing of metalwork.
ART 020 (GA) INTRODUCTION TO DRAWING (3) Introductory experience in making of art through drawing media; designed for nonmajors seeking general overview of studio practice.
ART 030 (GA) INTRODUCTION TO SCULPTURE (3) Introduction to sculpture for non-art majors consisting of lectures/basic studio work coordinated to cover broad range of processes.
ART 040 (GA) INTRODUCTION TO PRINTMAKING (3) Instruction and practice in elementary printmaking and papermaking processes.
ART 050 (GA) INTRODUCTION TO PAINTING (3) Introductory experience in making of art through painting media; designed for nonmajors seeking a general overview of studio practice.
ART 080 (GA) INTRODUCTION TO CERAMICS (3) Introduction to the concepts and techniques fundamental to the making of pottery and ceramic sculpture.
ART 090 (GA) (INART) INTRODUCTION TO PHOTOGRAPHY (3) An introduction to the aesthetics, history, and science of photography including practical and critical approaches to the art of photography.
ART 098 SPECIAL TOPICS (1–9)
ART 100 (GA) CONCEPTS AND CREATION IN THE VISUAL ARTS (3) A study of the personal and cultural foundations of artistic creation and practice of creative production in the art studio.
ART 110S IDEAS AS VISUAL IMAGES (3) Introduction to the ideational relationships among subject, form, and content in visual images. Prerequisite: portfolio review
ART 111 IDEAS AS OBJECTS (3) An introduction to the relationship between ideas and the creation of three-dimensional objects. Prerequisite: portfolio review

ART 120 BEGINNING DRAWING (3) The study and practice of basic drawing as a way of understanding and communicating. Prerequisite: portfolio review
ART 122W COMMENTARY ON ART (3) An introduction to verbal commentary, both oral and written, about art. The development of critical and expressive skills given emphasis.
ART 198 SPECIAL TOPICS (1–9)
ART 199 (GI) FOREIGN STUDIES—ART (1–12) Courses offered in foreign countries by individual or group instruction.
ART 201 INTRODUCTION TO COMPUTER GRAPHICS (3) Art 201 is a studio course introducing the student to graphics applications on the Macintosh computer.
ART 202 COMPUTER 3-DIMENSIONAL MODELING AND RENDERING (3) Art 202 is a studio course introducing the student to 3-D computer modeling and rendering applications on the Macintosh computer.
ART 217 BEGINNING METAL ARTS (3) Introduction to fundamental jewelry-making and small-scale metalsmithing processes, including conceptualization, fabrication, surface treatment, and finishing of metalwork. Prerequisite: ART 110S, ART 111, ART 120
ART 220 FIGURE DRAWING (3) Drawing from life. Emphasis on developing the ability to comprehend and record the human figure. Prerequisite: ART 110S, ART 111, ART 120
ART 223 DRAWING: TECHNIQUES, MATERIALS, AND TOOLS (3) Drawing with an emphasis on organization and the development of drawing skills through a variety of techniques, materials, and tools. Prerequisite: ART 110S, ART 111, ART 120
ART 230 BEGINNING SCULPTURE (3) An introduction to sculpture consisting of lectures, demonstrations, and basic studio work coordinated to cover a broad range of processes. Prerequisite: ART 110S, ART 111, ART 120
ART 240 BEGINNING PRINTMAKING (3) An introduction to printmaking consisting of lectures, demonstrations, and studio work to cover a broad range of processes. Prerequisite: ART 110S, ART 111, ART 120
ART 250 BEGINNING OIL PAINTING (3) The materials and techniques of painting in oil and their uses in creative painting on panels and canvas. Prerequisite: ART 110S, ART 111, ART 120
ART 251 ACRYLIC PAINTING (3) Introduction to the materials and techniques of creative painting with acrylic paints. Prerequisite: ART 110S, ART 111, ART 120
ART 260 BEGINNING WATERCOLOR PAINTING (3) Transparent watercolor painting on various papers; knowledge of materials, development of skills and creativity. Prerequisite: ART 110S, ART 111, ART 120
ART 270 BEGINNING GRAPHIC DESIGN (3) A beginning graphic design studio/lecture course intended to introduce students to the practice of graphic design. Prerequisite: ART 110S, ART 111, ART 120
ART 271 TYPOGRAPHY (3) A consideration of the word in relation to visual organization and its application to communication. Prerequisite: ART 270
ART 280 BEGINNING CERAMICS (3) The fundamentals of ceramics, throwing, hand-building, and glazing; acquainting the student with ceramic materials, techniques, and philosophy. Prerequisite: ART 110S, ART 111, ART 120
ART 290 BEGINNING PHOTOGRAPHY (3) Fundamental black-white techniques. Introduction to inherent qualities of photographic vision through study of historic/contemporary photography. Camera, light meter required.
ART 296 INDEPENDENT STUDIES (1–18)
ART 297 SPECIAL TOPICS (1–9)
ART 298 SPECIAL TOPICS (1–9)
ART 299 (GI) FOREIGN STUDY—ART (1–12) Courses offered in foreign countries by individual or group instruction.
ART 300 STUDIO APPRENTICESHIP (1–4 per semester, maximum of 8) Direct involvement in the creative process of the artist-teacher in the studio environment. Prerequisite: fifth-semester standing
ART 315 NEW MEDIA ART: NEW MEDIA STUDIO (4) A studio course concentrating on digital art and new media authoring practices. Prerequisite: ART 111, ART 120
ART 317 INTERMEDIATE METAL ARTS (4 per semester, maximum of 8) Concepts and practices in die forming, hot and cold forging, seamed and seamless raising, and experimental metalworking processes. Prerequisite: ART 217
ART 320 ADVANCED DRAWING (4 per semester, maximum of 8) Drawing for art majors; emphasis on sustained individual approaches based on figurative and nonfigurative sources. Prerequisite: ART 220
ART 330 INTERMEDIATE SCULPTURE (4 per semester, maximum of 8) Development of expressive and creative skills through selected studio problems in basic sculptural techniques. Prerequisite: ART 230
ART 331 SCULPTURE MATERIALS AND TECHNIQUES (4 per semester, maximum of12) Specialized study of various advanced sculpture techniques and materials through creative studio work. Prerequisite: ART 230
ART 338 FIGURE MODELING (4) Modeling the human figure as a means of sculptural expression. Prerequisite: ART 230
ART 340 PRINTMAKING (4 per semester, maximum of 8) Development of technical and expressive skills through selected problems in one or more of the print processes. Prerequisite: ART 240
ART 341 INTERMEDIATE PRINTMAKING: INTAGLIO (4) Instruction and practice in the fundamentals of the intaglio process; its relationship to the design and meaning of the print. Prerequisite: ART 240
ART 342 INTERMEDIATE PRINTMAKING: LITHOGRAPHY (4) Instruction and practice in the fundamentals of the lithographic process; its relationship to the design and meaning of the print. Prerequisite: ART 240

ART 350 INTERMEDIATE PAINTING (4 per semester, maximum of 8) A variable offering in painting; course conditions defined on a rotating basis according to needs of individuals and groups. Prerequisite: ART 250
ART 360 WATER-BASED MEDIA (4 per semester, maximum of 8) Practice in traditional techniques of transparent watercolor and experiment with opaque water paints in both representational and abstract expressions. Prerequisite: ART 260
ART 370 DESIGN PHOTOGRAPHY (4) An investigation of graphic photography processes and how print technology affects the final appearance of a photograph. Prerequisite: ART 271 and portfolio
ART 371 APPLIED COMMUNICATION (4) Definition and concentrated involvement in problem/audience analysis, with emphasis on understanding symbol and image in evoking audience response. Prerequisite: ART 370
ART 372 BOOK DESIGN (3) Writing, designing, illustrating and production (printing) of a book. Prerequisite: JUNIOR STANDING IN GRAPHIC DESIGN
ART 376 PACKAGING (3) Orientation to packaging designs as it relates to the consumer, client, and to societal and environmental concerns. Prerequisite: JUNIOR STANDING IN GRAPHIC DESIGN
ART 380 INTERMEDIATE THROWING (4 per semester, maximum of12) Intermediate ceramics course with focus on using wheel and throwing skills leading to personal expression in form, glazing, and firing. Prerequisite: ART 280
ART 381 INTERMEDIATE HANDBUILDING (4 per semester, maximum of12) An intermediate ceramics course with a focus on handbuilding techniques, leading to personal expression in forming, glazing, and firing. Prerequisite: ART 280
ART 390 INTRODUCTION TO PHOTOCHEMICAL PHOTOGRAPHY (4) Introduction to the fundamentals of black and white photochemical photography. Prerequisite: ART 110S, ART 111, ART 120, ART 290, and successful portfolio review
ART 391 PHOTOGRAPHIC BOOKS (4 per semester, maximum of 8) The development of a photographic project that leads to the creation of a handmade book. Prerequisite: ART 390
ART 392 DIGITAL PHOTOGRAPHY IN THE STUDIO (4) Concepts and technology of the digital photography studio; large format digital cameras, electronic studio lighting and digital printing. Prerequisite: ART 110S, ART 111, ART 120, ART 290, and successful portfolio review
ART 397 SPECIAL TOPICS (1–9)
ART 399 (GI) FOREIGN STUDY—ART (1–12) Courses offered in foreign countries by individual or group instruction.
ART 401 WOMEN ARTISTS IN THE 20TH CENTURY (3) An interdisciplinary course that investigates women artists who were integral to the production of twentieth century art primarily in the Americas and Europe including Asia. Prerequisite: fifth-semester standing
ART 411 SEMINAR IN CONTEMPORARY ART (3 per semester, maximum of 6) Trends in contemporary art investigated within the framework of studio visitations, museum tours, and through other related avenues of encounter. Prerequisite: ART 122W
ART 413 PERFORMANCE ART (3) The development, production, and presentation of performance art works, and the study of performance art theory and history. Prerequisite: 4 credits of 300-level art, or graduate level status, or permission of instructor
ART 415 INTEGRATING MEDIA: CONVERGENCE IN PRACTICE (4) A studio course concentrating on the integration of new media technologies in contemporary art practice. Prerequisite: ART 315
ART 416 NET ART: MULTIMEDIA WEB PUBLISHING (4) A studio course concentrating on multimedia online "net art" practice and Web publishing. Prerequisite: ART 315
ART 417 ADVANCED METAL ARTS (4 per semester, maximum of12) Advanced concepts and processes in jewelry and metalsmithing, with emphasis on the student's individual development. Prerequisite: ART 317
ART 421 DRAWING (4 per semester, maximum of12) Drawing for advanced students, with total emphasis on sustained individual approaches. Prerequisite: ART 320
ART 422 ADVANCED FIGURE DRAWING (4 per semester, maximum of 8) Concentrated work in recording and understanding the human figure. Prerequisite: ART 220, 8 credits of 300-level art courses
ART 430 ADVANCED SCULPTURE (4 per semester, maximum of12) Advanced work in sculpture, with an emphasis on individual development. Prerequisite: ART 330, ART 331, 12 CREDITS OF 300-LEVEL SCULPTURE
ART 431 INSTALLATION ART (4) Study and production of original visual statements through installation work as an art form. Prerequisite: 4 credits of 300-level art, or graduate level status
ART 440 ADVANCED PRINTMAKING (4 per semester, maximum of12) Individual projects in one or more of the printmaking processes. Emphasis is on developing a portfolio of prints. Prerequisite: 4 credits of 300-level printmaking courses, 8 credits total of 300-level art courses
ART 445 HANDMADE PAPERMAKING (4 per semester, maximum of12) Papermaking will involve experimentation with methods of forming works of art with handmade paper and three-dimensional paper pulp pieces. Prerequisite: ART 110S, ART 111, ART 120
ART 446 ARTISTS BOOKS (4) Study and production of original visual statements through the book as an art form. Prerequisite: ART 110S, ART 111, ART 120
ART 447 PHOTO BASED PRINTMAKING (4) Study and production of original visual statements through photographic based printmaking as an art form. Prerequisite: ART 240, 4 credits of 300-level Art courses, or graduate level status

ART 450 ADVANCED PAINTING (4 per semester, maximum of12) Development of the artist through a series of commitments; each semester serves as a contractual agreement along professional lines. Prerequisite: ART 350
ART 455 ADVANCED PAINTING CRITIQUE (4 per semester, maximum of 8) The painter in relation to his peers and his profession. Prerequisite: senior or graduate standing
ART 460 ADVANCED WATER-BASED MEDIA (4 per semester, maximum of 8) Further practice in the use of watercolor and related media. Prerequisite: ART 360
ART 470 TIME AND SEQUENCE (4) Development of visual sequence as replies to graphic design problems. Prerequisite: ART 371
ART 471 SENIOR PROBLEMS (4) The solving of complex design problems emphasizing group and team projects, simulating actual practice. Prerequisite: ART 470
ART 473 GRAPHIC DESIGN SEMINAR (3) A seminar on subjects which relate to the field of graphic design. Prerequisite: junior standing in graphic design
ART 474 GRAPHIC DESIGN AND THE COMPUTER (4) Theoretical and practical aspects of computer application to graphic design. Prerequisite: JUNIOR STANDING IN GRAPHIC DESIGN
ART 475 PRACTICAL COMMUNICATIONS (1–3 per semester) Practical design experience for students through design/publicity problems from the University and community non-profit organizations. Prerequisite: SENIOR STANDING IN GRAPHIC DESIGN
ART 480 ADVANCED CERAMIC ARTS (4 per semester, maximum of12) Individual exploration of ceramic materials and construction leading to graduate study or career development as a professional potter. Prerequisite: ART 380
ART 481 CERAMIC MATERIALS AND GLAZE CALCULATION (3) The study of raw materials and their use in formulating clays and glazes. Prerequisite: ART 280
ART 490 VIEW CAMERA PHOTOGRAPHY (4) Experience with diverse camera formats and applications; particular emphasis on view camera. Prerequisite: ART 390
ART 492 CREATIVE PROJECTS IN PHOTOGRAPHY (4 per semester, maximum of 8) Special individual problems related to photographic vision. Prerequisite: ART 391, ART 392
ART 494 PHOTO ASSEMBLAGE (4) Collage making through collecting and assembling found materials, including photography; origins of photographic manipulation and contemporary uses. Prerequisite: ART 390
ART 495 INTERNSHIP (1–18)
ART 496 INDEPENDENT STUDIES (1–18)
ART 497 SPECIAL TOPICS (1–9)
ART 499 (GI) FOREIGN STUDIES—ART (1–12).

ART (C ART)

Capital College

C ART 305 PRINCIPLES OF TWO-DIMENSIONAL DESIGN (3) A studio introduction to the elements of design and the principles of two-dimensional compositional structure.
C ART 310 INTRODUCTION TO THE VISUAL ARTS (3) Introduction to the style, formal principles, and historical context of painting, sculpture, and architecture.
C ART 315 APPROACHES TO DRAWING (3) A studio course emphasizing basic skills, concepts, and media in structural drawing and composition of volumetric space.
C ART 325 ART IN TIME (3 per semester) Development of art in historical perspective, focusing on one segment of time. (May be repeated for credit.)
C ART 350 GRAPHICS (3) This course reviews basic design principles, teaches students how to critically analyze visual material and how to prepare art for production.
C ART 415 APPROACHES TO PAINTING (3 per semester) Study of opaque and transparent media, emphasizing development of painting techniques, critical judgment, and personal style. (May be repeated for credit.)
C ART 420 CRITICAL APPROACHES TO ART (3) An introduction to criticism and theory as applied to the visual arts in their historical context. Prerequisite: C ART 310
C ART 425 TOPICS IN STUDIO ART (3) This umbrella title would precede various studio courses with specific themes like Life Drawing or Landscape Painting. (May be repeated for credit.) Prerequisite: prior course in drawing, design, or painting
C ART 427 MASTERS OF ART (3 per semester) Intensive study of one or more of the great masters of the visual arts. (May be repeated for credit.)
C ART 428 RENISSANCE ART (3) Painting, sculpture and architecture in Europe, 1300–1600.
C ART 429 BAROQUE ART (3) Painting, sculpture and architecture in Europe, 1600–1750.
C ART 430 NINETEENTH-CENTURY ART IN EUROPE (3) Painting, sculpture and architecture in Europe, 1800-1900.
C ART 431 MODERN ART (3) Painting, sculpture and architecture in Europe, from 1900 to the present, and in America since 1945.
C ART 440 TOPICS IN ART (3 per semester) Selected topics on painting, sculpture, or architecture. (May be repeated for credit.)
C ART 497 SPECIAL TOPICS (1–9)

ART EDUCATION (A ED)

College of Arts and Architecture

A ED 101S INTRODUCTION TO ART EDUCATION (3) This course introduces students to issues, concepts, and ideas in Art Education.

A ED 201W HISTORY AND PHILOSOPHY OF ART EDUCATION IN SCHOOLS AND CULTURAL INSTITUTIONS (3) Introduction to historical, philosophical, and sociological foundations art education in schools and cultural institutions, museums, and community organizations.

A ED 211 (GA) INTERPRETING ART EXPERIENCE: SOCIAL AND BEHAVIORAL PERSPECTIVES (3) Examination of psychological, cultural, aesthetic, philosophical and educational perspectives on creation and response to art in children, adolescents and adults.

A ED 212 INTERPRETING ART EXPERIENCE: EDUCATIONAL IMPLICATIONS (1) In-depth study of the educational implications of the information on art making and response introduced in A ED 211. Prerequisite: A ED 101S, A ED 201W Concurrent: A ED 211

A ED 222 TV AND FILM TECHNIQUES FOR SCHOOLS (3) An exploratory course in the use of light media for visual communication. Concurrent: A ED 114, A ED 434, A ED 435, A ED 436

A ED 225 (GA;GI) DIVERSITY, PEDAGOGY, AND VISUAL CULTURE (3) Issues of diversity in art, education, visual culture, and pedagogy.

A ED 237 HISTORICAL AND PHILOSOPHICAL FOUNDATIONS OF ART EDUCATION (2) Introduction to history and philosophy of art education, including current developments in theory and practice. Prerequisite: Second-semester standing; 12 credits in any combination of art, art education, education, or art history

A ED 296 INDEPENDENT STUDIES (1–18)

A ED 297 SPECIAL TOPICS (1–9)

A ED 303 THE VISUAL ARTS IN THE ELEMENTARY SCHOOL (3) Basic concepts of current art education theory and practice for the elementary teacher.

A ED 322 VISUAL CULTURE AND INSTRUCTIONAL TECHNOLOGY (3) An introduction to the world(s) of art as explored and revealed through the medium of technology. Art Education majors only. Prerequisite: A ED 101S, A ED 201W, ART 110, ART 111

A ED 323 VISUAL CULTURE AND ART EDUCATION (3) Inquiry into museum/visual culture and its texts, theories, and issues that provide a basis for K-12 art education. Art Education majors only. Prerequisite: A ED 101S, A ED 201W, ART 110, ART 111

A ED 354 ART CURRICULUM THEORY AND DEVELOPMENT (3) Design and development of art curricula for the elementary and secondary schools. Concurrent: A ED 350, A ED 351W, A ED 352, A ED 353

A ED 397 SPECIAL TOPICS (1–9)

A ED 401 CURRICULA, PEDAGOGY, AND ASSESSMENT IN ART EDUCATION (3) Preparation of curricula, pedagogical, and assessment strategies for elementary/secondary school and museum art education programs. Prerequisite: A ED 101S, A ED 201W, A ED 211, A ED 212, A ED 225, A ED 322, A ED 323

A ED 440 CULTURAL INSTITUTIONS (3) Role of the educator and educational programming in museums and other cultural institutions. Prerequisite: ANTH 100 or 3 credits of Art History courses from department list; A ED 401

A ED 488 CULTURAL INSTITUTIONS PRACTICUM (1–3) Supervised field experience in a museum or other cultural institution, including planning, implementation, and evaluation of an educational project. Prerequisite: ANTH 100 or 3 credits of art history courses from department list; A ED 401 Concurrent: A ED 490

A ED 489 ADVANCED PRACTICUM (3) Supervised observation, unit planning, and teaching in Saturday Morning Arts School: analysis of creative expressions and art programs for learners. Prerequisite: A ED 401 Concurrent: A ED 490

A ED 490 CAPSTONE COURSE IN ART EDUCATION (2 credits per semester) Synthesis of preservice art education coursework; introduction to professional practices and standards; completion of teaching and learning portfolio. Prerequisite: admission to Teacher Preparation Program and successful completion of all required courses in the major except Student Teaching or final internship. Prerequisite or concurrent: A ED 488 for majors in the Museums and Cultural Institutions option Concurrent: A ED 489 majors in the Schools option

A ED 494 SCHOOLS AND MUSEUMS (3) Museum education: issues, theories of aesthetic education and practices in schools, museums, and community art centers. Prerequisite: 12 credits in art education, art, art history, or education

A ED 495 INTERNSHIP IN ART EXPERIENCES (15) Comprehensive instruction in craft, health, cultural, museum, studio, gallery or social agency. Students supervised by University personnel and arts personnel. Prerequisite: A ED 440; seventh- or eighth-semester standing

A ED 496 INDEPENDENT STUDIES (1–18)

A ED 497 SPECIAL TOPICS (1–9)

ART HISTORY (ART H)

College of Arts and Architecture

ART H 001S (GA) FIRST-YEAR SEMINAR (3) An introduction to the field of art history, through an examination of a selected issue in a seminar setting.

ART H 100 (GA) INTRODUCTION TO ART (3) An approach to the understanding of art through a critical analysis of selected works of architecture, painting, and sculpture. Students who have passed Art H 110 may not schedule this course.

ART H 111 (GA) ANCIENT TO MEDIEVAL ART (3) Survey of Ancient Egyptian, Greek, Roman, Byzantine, Early Medieval, Romanesque, and Gothic art, with an emphasis on sculpture and painting.
ART H 112 (GA) RENAISSANCE TO MODERN ART (3) Survey of Renaissance, Baroque, Rococo, Romantic, Modern, and Contemporary art, with an emphasis on painting, sculpture, and graphic arts.
ART H 120 (GA;GI) ASIAN ART AND ARCHITECTURE (3) A selective overview of the art and architecture of India, Southeast Asia, China, Korea, and Japan.
ART H 130 (GA;GI) AFRICAN, OCEANIC, AND NATIVE AMERICAN ART (3) A selective overview of the history of African, Oceanic, and Native American art.
ART H 197 SPECIAL TOPICS (1–9)
ART H 198 SPECIAL TOPICS (1–9)
ART H 199 (GI) FOREIGN STUDY—ART HISTORY (1–12) Courses offered in foreign countries by individual or group instruction.
ART H 201 (GA) ANCIENT TO MEDIEVAL ARCHITECTURE (3) A survey of Prehistoric, Ancient Near Eastern Egyptian, Greek, Roman, Early Christian, Byzantine, Early Medieval, Romanesque, and Gothic architecture.
ART H 202 (GA) RENAISSANCE TO MODERN ARCHITECTURE (3) A survey of Renaissance, Baroque, Rococo, Romantic, Victorian, Modern, Post- Modern, and Contemporary architecture in Europe and America.
ART H 296 INDEPENDENT STUDIES (1–18)
ART H 297 SPECIAL TOPICS (1–9)
ART H 298 SPECIAL TOPICS (1–9)
ART H 299 (GI) FOREIGN STUDY—ART HISTORY (1–12) Courses offered in foreign countries by individual or group instruction.
ART H 300H HONORS COURSE IN ART HISTORY (3–12) Readings, discussion, oral and written reports on selected topics in art history. Prerequisite: fifth-semester standing, all-University and art history average of B, and invitation by Department Honors Committee
ART H 301 (GA) EGYPTIAN AND MESOPOTAMIAN ART (3) Art of the Ancient Near East, including Egypt, Mesopotamia, and neighboring civilizations.
ART H 302 (GA) ART OF THE EARLY MIDDLE AGES (3) A survey of the art of Western Europe from the Early Christian era through the Ottonian Empire, c.300-1050 A.D.
ART H 303 (GA) ITALIAN RENAISSANCE ART (3) The major arts in Italy from the thirteenth century A.D. through the Renaissance; emphasis on sculpture and painting.
ART H 304 (GA) SOUTHERN BAROQUE PAINTING (3) Seventeenth-century painting in Italy, France, and Spain. Emphasis will be on Italy as the vanguard country.
ART H 305 (GA) EUROPEAN ART FROM 1780-1860 (3) A survey of painting and sculpture in Europe 1780-1860, from the origins of Neoclassicism through Romanticism and Realism.
ART H 306 (GA) ENGLISH ART (3) An introduction to the history of art in England by examining selected themes and issues.
ART H 307 (GA) AMERICAN ART (3) History of art in the English colonies and the United States from the seventeenth century to the present.
ART H 311 (GA) GREEK AND ROMAN ART (3) Greek and Roman art, with emphasis on painting and sculpture.
ART H 312 (GA) ROMANESQUE AND GOTHIC ART (3) Survey of the architecture, sculpture, and painting of the Christian church in western Europe from 1000 to 1500.
ART H 313 (GA) NORTHERN RENAISSANCE ART (3) Art in northern Europe in the fifteenth and sixteenth centuries, emphasizing painters such as Van Eyck, Durer, and Bruegel.
ART H 314 (GA) ART IN THE AGE OF REMBRANDT (3) Dutch and Flemish painting in the seventeenth century.
ART H 320 (GA;GI) CHINESE ART (3) A general survey of the great periods of Chinese art from the Shang dynasty until the modern period.
ART H 324 (GA) ROCOCO ART (3) Eighteenth-century art in western Europe, with emphasis on artists such as Watteau, Fragonard, Falconet, Le Gros, Tiepolo, Guardi, Neumann.
ART H 325 (GA) IMPRESSIONISM TO SURREALISM (3) A survey of European painting and sculpture from ca. 1850 to ca. 1940.
ART H 330 (GA;GI) ISLAMIC ARCHITECTURE AND ART (3) Survey of the art and architecture of Islamic lands from the late seventh century until the eighteenth century.
ART H 335 (GA;GI) (AAA S) AFRICAN ART (3) Introduction to the visual arts of Africa, including contemporary African art and the influence of African art outside Africa.
ART H 340 (GA;GI) JAPANESE ART (3) This course will examine the art and architecture of Japan, its relationship to Chinese art, and its influence on European art.
ART H 350W UNDERGRADUATE SEMINAR IN THE HISTORY OF ART (3–6) An introduction to original research, methodology, analysis, and writing on a scholarly level. Prerequisite: fifth-semester standing, 6 credits in art history at the 300 level or above
ART H 397 SPECIAL TOPICS (1–9)
ART H 398 SPECIAL TOPICS (1–9)
ART H 399 (GI) FOREIGN STUDY—ART HISTORY (1–12) Courses offered in foreign countries by individual or group instruction. Prerequisite: ART H 100 or ART H 110 or ART H 111 or ART H 112

ART H 401 GREEK ART AND ARCHITECTURE (3–9) Developments in Greek art and architecture, tenth century B.C. to first century B.C.; emphasis on the importance of Greek sanctuaries. Prerequisite: ART H 100, ART H 111, ART H 201, or ART H 311

ART H 402 THE ILLUMINATED MANUSCRIPT (3) Specific stylistic periods in manuscript painting from A.D. 500-1500 in Western Europe and Byzantium. Prerequisite: ART H 100, ART H 111, ART H 302, or ART H 312

ART H 404 THE ART OF COLONIAL AMERICA (3) A survey of the visual arts in the North American colonies from the explorer artists to the American Revolution. Prerequisite: ART H 100, ART H 112, ART H 202, or ART H 307

ART H 405 PIONEERS OF MODERN ARCHITECTURE (3–6) Selected period or theme in the development of modern architecture during the nineteenth and/or early twentieth centuries. Prerequisite: ART H 100, ART H 112, ART H 202, or ART H 307

ART H 410 TASTE AND CRITICISM IN ART (3) History and literature of art criticism demonstrating the varied philosophic, cultural, iconographic, technical, and visual approaches. Prerequisite: 6 credits of art history

ART H 411 ROMAN ART (3–9) Roman sculpture and painting from Augustus to Constantine. Prerequisite: ART H 100, ART H 111, ART H 201, or ART H 311

ART H 412 THE GOTHIC CATHEDRAL (3) Specific aspects of Romanesque and Gothic church architecture of western Europe, especially France and England, between 1000-1500. Prerequisite: ART H 100, ART H 111, ART H 201, ART H 302, or ART H 312

ART H 414 ITALIAN BAROQUE PAINTING (3) Survey of Italian Baroque painting from sixteenth-century proto-Baroque masters to painters of the late Baroque and Rococo periods. Prerequisite: ART H 100, ART H 112, or ART H 304

ART H 415 THE SKYSCRAPER (3) Origin and evolution of the skyscraper as seen against the background of cultural conditions and technological factors. Prerequisite: ART H 100, ART H 112, ART H 202, or ART H 307

ART H 416 AMERICAN PAINTING: 1876-1913 (3) Art in the United States between 1876 and 1913; emergence of an American art and transition to the modern styles. Prerequisite: ART H 100, ART H 112, or ART H 307

ART H 420 RUSSIAN ARCHITECTURE (3) Russian architecture from the first Orthodox churches of the late tenth century to the end of the Soviet Union. Prerequisite: ART H 100, ART H 111, ART H 112, ART H 201, or ART H 202

ART H 422 STUDIES IN MEDIEVAL SCULPTURE (3–9) Specific studies of western European sculpture, 300-1500, with attention to sources, styles, type, and iconography. Prerequisite: ART H 100, ART H 111, ART H 201, ART H 302, or ART H 312

ART H 423 STUDIES IN ITALIAN RENAISSANCE ART (3–9) Specific studies of Italian Renaissance art, including the work of artists such as Leonardo da Vinci, Michaelangelo, and Raphael. Prerequisite: ART H 100, ART H 112, ART H 202, or ART H 303

ART H 424 MASTERS OF NORTHERN BAROQUE ART (3) Seventeenth-century painters in Flanders and Holland, including the works of artists such as Rubens, Rembrandt, and Vermeer. Prerequisite: ART H 100, ART H 112, or ART H 314

ART H 430 GOYA AND HIS TIMES (3) The art of Francisco de Goya from the Rococo eighteenth century to the beginnings of Romanticism. Prerequisite: ART H 100, ART H 112, ART H 305, or ART H 324

ART H 432 PROBLEMS IN ICONOLOGY (3–9) The investigation of content and meaning in major monuments of the history of art. Prerequisite: 6 credits of art history

ART H 435 STUDIES IN MODERN ART (3–6) Lectures focusing on a selected movement of nineteenth- or twentieth-century art. Prerequisite: ART H 100, ART H 112, ART H 305, ART H 307, or ART H 325

ART H 442 LATE ANTIQUE AND EARLY CHRISTIAN ART (3) Survey of the architecture, painting, and minor arts of Christian society from the beginning to the mid-sixth century. Prerequisite: ART H 100, ART H 111, ART H 201, or ART H 302

ART H 450 THE HISTORY OF PHOTOGRAPHY (3) The history of photography from 1839, with particular emphasis on the relationship with the plastic arts. Prerequisite: ART H 100, ART H 112, ART H 305, ART H 307, or ART H 325

ART H 452 BYZANTINE ART (3) Monumental and minor arts of Byzantium and related areas from the reign of Justinian to the Turkish conquest of Constantinople. Prerequisite: ART H 100, ART H 111, ART H 201, or ART H 302

ART H 454 SPANISH BAROQUE ART (3) Survey of seventeenth-century Spanish painting and sculpture, with an emphasis on Velasquez, Murillo, Ribera, and Zurbaran. Prerequisite: ART H 100, ART H 112, or ART H 304

ART H 456 GIAN LORENZO BERNINI AND THE ARCHITECTURE OF THE FULL BAROQUE IN ROME (3) In-depth investigation into the architectural works and conceptual practices of Bernini and his contemporaries, with accentuation of specific monuments. Prerequisite: ART H 100, ART H 112, or ART H 202

ART H 458 ROMAN ROCOCO ARCHITECTURE AND THE DAWN OF NEOCLASSICISM (3) Investigation into the legacy of the three giants of the Roman High Baroque: Bernini, Borromini, and Pietro da Cortona. Prerequisite: ART H 100, ART H 112, or ART H 202

ART H 464 FRENCH BAROQUE PAINTING (3) Examination of seventeenth-century French painting, including Italian influences; the provincial, Classical, and official styles in France. Prerequisite: ART H 100, ART H 112, or ART H 304

ART H 470 AMERICAN PAINTING AND SCULPTURE SINCE 1940 (3) Painting and sculpture in the United States from the origins of Abstract Expressionism through the present. Prerequisite: ART H 100, ART H 112, ART H 307, or ART H 325
ART H 496 INDEPENDENT STUDIES (1–18)
ART H 497 SPECIAL TOPICS (1–9)
ART H 498 SPECIAL TOPICS (1–9)
ART H 499 (GI) FOREIGN STUDY—ART HISTORY (1–12) Courses offered in foreign countries by individual or group instruction

ARTS AND ARCHITECTURE (A&A)

College of Arts and Architecture
A&A 294, 494. RESEARCH PROJECT COURSES (1–12)

ASTRONOMY AND ASTROPHYSICS (ASTRO)

Eberly College of Science
ASTRO 001 ASTRONOMICAL UNIVERSE (3) The development of modern understanding of the astronomical universe from planets and stars to galaxies and cosmology. Student who have passed ASTRO 010 may not take this course.
ASTRO 010 (GN) ELEMENTARY ASTRONOMY (2) Introductory survey of modern astronomy from planets and stars to galaxies and the universe. Students who have passed ASTRO 001 may not take this course. Students may not receive General Education credit for ASTRO 010 unless they also take ASTRO 011.
ASTRO 011 (GN) ELEMENTARY ASTRONOMY LABORATORY (1) Selected experiments and explorations to illustrate major astronomical principles and techniques. Telescopes observations of planets, stars and nebulae. Prerequisite: or concurrent: ASTRO 001 or ASTRO 010
ASTRO 020S FIRST-YEAR ASTRONOMY SEMINAR (2) Introduction to the study of modern astronomy through discussions, activities, and writing.
ASTRO 097 SPECIAL TOPICS (1–9)
ASTRO 120 (GN) THE BIG BANG UNIVERSE (3) Exploration of cosmology, birth, and ultimate fate of the universe; origin of galaxies, quasars, and dark matter. For non-science majors. Prerequisite: ASTRO 001 OR ASTRO 010
ASTRO 130 (GN) BLACK HOLES IN THE UNIVERSE (3) The predicted properties of black holes and the astronomical evidence for their existence are investigated in the context of modern ideas about space, time, and gravity. Prerequisite: ASTRO 001 or ASTRO 010
ASTRO 140 (GN) LIFE IN THE UNIVERSE (3) The problem of the existence of life beyond Earth is investigated, drawing from recent research in astronomy and other fields. For non-science majors. Prerequisite: ASTRO 001 OR ASTRO 010
ASTRO 199 (GI) FOREIGN STUDIES (1–12)
ASTRO 291 (GN) ASTRONOMICAL METHODS AND THE SOLAR SYSTEM (3) Physical processes and observational techniques in astronomical systems, characteristics of the sun, planets, and moons. Prerequisite: PHYS 211
ASTRO 292 (GN) ASTRONOMY OF THE DISTANT UNIVERSE (3) Observed properties and astrophysical understanding of stars, stellar evolution, galaxies, the large-scale universe, and cosmology. Prerequisite: ASTRO 291
ASTRO 293 OBSERVATIONAL ASTRONOMY LABORATORY (1) Selected experiments in observational astronomy using telescopes and modern instrumentation; emphasizing the process of data acquisition, analysis, and scientific discovery. Concurrent: ASTRO 292
ASTRO 296 INDEPENDENT STUDIES (1–18)
ASTRO 297 SPECIAL TOPICS (1–9)
ASTRO 399 (GI) FOREIGN STUDIES (1–12)
ASTRO 400H HONORS SEMINAR (1 credits per semester) Presentations of various branches and modes of modern astrophysical research, based on lectures, visits to telescopes and facilities, and discussions. Prerequisite: ASTRO 292
ASTRO 410 COMPUTATIONAL ASTROPHYSICS (3) Applications of numerical methods and computer programming to astrophysics, including stellar physics and cosmology. Prerequisite: CMPSC 201C or CSE 103; PHYS 212, PHYS 213, and PHYS 214
ASTRO 440 INTRODUCTION TO ASTROPHYSICS (3) Theoretical investigation of physical processes in astronomical objects and systems; modern physical interpretation of astronomical phenomena. Prerequisite: MATH 230, PHYS 237
ASTRO 451 ASTRONOMICAL TECHNIQUES (2) Practical methods of modern observational astronomy, detectors, filters, instrumentation for both ground-based and space observations, and data analysis. Prerequisite: PHYS 212, PHYS 213, PHYS 214
ASTRO 452 ADVANCED ASTRONOMY LABORATORY (1) Selected experiments and instrumentation techniques in various fields of modern astronomy. Prerequisite: or concurrent: ASTRO 292, ASTRO 451
ASTRO 475W STARS AND GALAXIES (3) Astronomical studies concerning the distribution and evolution of stars and gas in our and other galaxies. Prerequisite: ASTRO 292

ASTRO 480 NEBULAE, GALAXIES, AND COSMOLOGY (3) Emission-line spectroscopy, structure and evolution of galaxies, physics of galactic nuclei and quasars, observational cosmology. Prerequisite: ASTRO 292, PHYS 212, PHYS 213, PHYS 214
ASTRO 485 INTRODUCTION TO HIGH-ENERGY ASTRONOMY (3) The study of black holes, neutron stars, white dwarfs, supernova remnants, and extragalactic objects through x-ray and gamma ray observations. Prerequisite: PHYS 237
ASTRO 496 INDEPENDENT STUDIES (1–18)
ASTRO 497 SPECIAL TOPICS (1–9)
ASTRO 499 (GI) FOREIGN STUDIES (1–12)

BEHAVIORAL SCIENCES (BE SC)

Capital College
BE SC 302 PERSPECTIVES IN PSYCHOLOGY (3) Study of issues and concepts in psychology intended for non-majors; behavior, development, perception, personality, conflict, and learning.
BE SC 370 COMMUNITY PSYCHOLOGY (3) Introduction to concepts and terminology of community psychology with discussion of historical development. Community mental health issues will be analyzed.
BE SC 376 INTRODUCTION TO HUMAN SERVICE ORGANIZATIONS (3) A course designed to acquaint the student with the role of various social agencies.
BE SC 395 BEHAVIORAL SCIENCE INTERNSHIP (3–12) Internship in human service organizations providing for application of academic knowledge, reading, and discussion. Prerequisite: 90 credits with at least 16 credits in the major
BE SC 407 SMALL GROUPS COUNSELING (3) Intensive survey of research and theory on behavior in small groups, with emphasis on interdependence, cooperation, and attitude change. Prerequisite: general psychology, general sociology, or general behavioral science
BE SC 408 GROUP FACILITATION AND LEADERSHIP SKILLS (3) Skill training in group facilitation and leadership based on analyses of roles and interpersonal dynamics plus differences among impact population. Prerequisite: general psychology, general sociology, or general behavioral science
BE SC 410 HUMAN RELATIONS (3) Analysis and theoretical principles of semantics and complex human relations in the family, industry, and informal organizations. Prerequisite: general psychology, general sociology, or general behavioral science
BE SC 459 BASIC COUNSELING SKILLS (3) Behavioral, cognitive, and expressive methods of assessing and enhancing life- coping skills. Prerequisite: general psychology, general sociology, or general behavioral science
BE SC 461 THEORIES AND MODELS OF COUNSELING (3) A survey of the various methods of counseling as well as the theories behind them. Prerequisite: general psychology, general sociology, or general behavioral science
BE SC 464 (DF) (WOMST) FEMININE/MASCULINE (3) Study of sex role learning; investigating feminine/masculine labeling; implications for contemporary society. Prerequisite: general psychology or general sociology
BE SC 468 INDUSTRIAL PSYCHOLOGY: SIGNIFICANT ISSUES (3) A survey of major sociopsychological issues involved in the study of worker behavior and the industrial organization. Prerequisite: general psychology, general sociology, or general behavioral science
BE SC 494 SENIOR THESIS (3–9) Problem formulation, literature search, research design, data collection, analysis of results, and final write-up of a substantial research project. Prerequisite: permission of program
BE SC 496 INDEPENDENT STUDIES (1–18)
BE SC 497 SPECIAL TOPICS (1–9)

BERKS-LEHIGH VALLEY COLLEGE (BKLV)

BKLV 097, 098; 197, 198; 297, 298; 397, 398; 497, 498 SPECIAL TOPICS (1–9)
BKLV 099, 199, 299, 399, 499 (GI) FOREIGN STUDIES (1–12)
BKLV 294, 394, 494 RESEARCH PROJECT (1–12)
BKLV 295, 395, 495 INTERNSHIP (1–18)
BKLV 296, 496 INDEPENDENT STUDIES (1–18)

BIOBEHAVIORAL HEALTH (BB H)

College of Health and Human Development
BB H 019 HEALTH AND DISEASE (1) Essentials of communicable and chronic disease control.
BB H 019S HEALTH AND DISEASE (1) Essentials of communicable and chronic disease control.
BB H 043 DRUGS IN SOCIETY (1) An exploration of the health-related aspects of drug use and abuse.
BB H 045 ALCOHOL AWARENESS EDUCATION (1) A course designed to raise awareness relative to the use and abuse of beverage alcohol.
BB H 046 INTRODUCTION TO HEALTH ASPECTS OF HUMAN SEXUALITY (1) An examination of health concerns related to sexuality and sexual behavior.
BB H 046S INTRODUCTION TO HEALTH ASPECTS OF HUMAN SEXUALITY (1) An examination of health concerns related to sexuality and sexual behavior.

BB H 048 (GHA) VALUES AND HEALTH BEHAVIOR (1.5) Examination of issues that impact the social, emotional, and physical well-being of college students through a values and decision-making process.
BB H 101 (GHA) INTRODUCTION TO BIOBEHAVIORAL HEALTH (3) Introduction to an interdisciplinary study of health, examining the interaction of biological processes and behavior on health.
BB H 101H (GHA) INTRODUCTION TO BIOBEHAVIORAL HEALTH (3) Introduction to interdisciplinary study of health, examining the interaction of biological processes and behavior on health.
BB H 119 (GHA) BEHAVIOR, HEALTH, AND DISEASE (3) Principles of health promotion, disease prevention, and treatment of acute and chronic illness. This course is designed for non-BB H majors.
BB H 143 (GHA) DRUGS, BEHAVIOR, AND HEALTH (3) Health aspects of use and abuse of licit and illicit drugs; related social problems and prevention. Designed for non-BB H majors.
BB H 145 PEER ALCOHOL EDUCATOR TRAINING (2) Study of alcohol physiology and issues related to alcohol use on campus. Skill for peer alcohol educators will be covered.
BB H 146 (GHA) INTRODUCTION TO HEALTH AND HUMAN SEXUALITY (3) An examination of human sexuality as it relates to health.
BB H 148S COPING WITH COLLEGE: A FIRST YEAR TRANSITION SEMINAR (2) Exploration of effective learning strategies, university resources, academic requirements and planning, career development issues in discussion-centered environment.
BB H 296 INDEPENDENT STUDIES (1–18)
BB H 297 SPECIAL TOPICS (1–9)
BB H 301 VALUES AND ETHICS IN HUMAN DEVELOPMENT PROFESSIONS (3) Examines bases for choices among values in personal and professional relations in human development processes and supporting services.
BB H 302 (GI) DIVERSITY AND HEALTH (3) Examine the relationship of diverse personal and sociocultural factors to health, like socioeconomic class, race-ethnicity, gender, age, and sexual orientation. Prerequisite: PSY 002 or SOC 001
BB H 310W RESEARCH STRATEGIES FOR STUDYING BIOBEHAVIORAL HEALTH (3) Surveys the various research methodologies used in biomedical research, including case, epidemiological, quasiexperimental and experimental approaches. Prerequisite: BB H 101, STAT 200
BB H 311 INTERDISCIPLINARY INTEGRATION IN BIOBEHAVIORAL HEALTH (3) A review of literature relevant to the concepts and findings of different scientific domains as they apply to biobehavioral health. Prerequisite: BB H 101, BIOL 110, PSY 002
BB H 315 (GI) GENDER AND BIOBEHAVIORAL HEALTH (3) Interdisciplinary study of gender, examining the interaction of biological, behavioral, and sociocultural factors on health differentials throughout the lifespan. Prerequisite: BB H 101
BB H 316 FOUNDATIONS AND PRINCIPLES OF HEALTH PROMOTION (3) Basic exposure and skills development in theory and practice in health promotion. Prerequisite: BB H 101
BB H 320 HEALTHWORKS CORE PEER EDUCATION TRAINING (1) Core training, for students accepted into the Healthworks Peer Education Program, to provide reliable health-related information to their peers.
BB H 321 HEALTHWORKS ALCOHOL, TOBACCO, AND OTHER DRUG PEER EDUCATION TRAINING (2) To train students accepted into the Healthworks Peer Education Program, to provide reliable alcohol and other drug information to their peers. Concurrent: BB H 320
BB H 322 HEALTHWORKS SEXUAL HEALTH PEER EDUCATION TRAINING (2) To train students accepted into the Healthworks Peer Education Program, to provide reliable sexual health information to their peers. Concurrent: BB H 320
BB H 323 HEALTHWORKS WELLNESS PEER EDUCATION TRAINING (2) To train students accepted into the Healthworks Peer Education Program, to provide wellness information to their peers. Concurrent: BB H 320
BB H 346 PEER SEXUAL HEALTH PROMOTION (3) Provides information, process, and program presentation skills to peer/ sexuality educators for promotion of sexual health among diverse groups.
BB H 368 NEUROANATOMY, BEHAVIOR, AND HEALTH (3) The neuroanatomical bases of behavior, health, and disease. Prerequisite: BB H 101; BI SC 004, BIOL 141, or PSY 203
BB H 410 DEVELOPMENTAL AND HEALTH GENETICS (3) Discussion of genetic influences on development and the interrelationships between genetics and health. Prerequisite: BIOL 033 or BIOL 222; STAT 200, STAT 220, or STAT 250
BB H 411 RESEARCH AND APPLICATIONS IN BIOBEHAVIORAL HEALTH (3) Research methods, multi-level analyses, and applications in biobehavioral health. Prerequisite: BB H 101, BB H 310W, STAT 200
BB H 416 HEALTH PROMOTION II: PLANNING, IMPLEMENTATION, AND EVALUATION (3) Planning, implementation, and evaluation of health promotion, prevention, and intervention programs; emphasizing evaluation. Prerequisite: BB H 310W, BB H 316
BB H 417 ADVANCED APPLICATIONS IN HEALTH PROMOTION (3) Advanced learning experience in health promotion applications in which students will actively participate in planning, implementing, evaluating health programs. Prerequisite: BB H 416
BB H 420 DEVELOPING STRESS MANAGEMENT PROGRAMS (3) Planning, developing, and implementing strategies for stress management programs for health education professionals in school, community, and corporate settings.
BB H 422 SAFETY EDUCATION (3) Principles and practices of accident prevention; home, school, highway, work, and public places. Prerequisite: HL ED 060, 3 credits in psychology

BB H 432 BIOBEHAVIORAL ASPECTS OF STRESS (3) Comprehensive discussion on the mechanisms of stress-induced diseases. Prerequisite: BB H 101, BIOL 141
BB H 440 (H P A) PRINCIPLES OF EPIDEMIOLOGY (3) Theory of epidemiology and significant case studies; potential applications to health care. Prerequisite: BB H 101 or BIOL 110 or H P A 310; STAT 200 or STAT 250
BB H 444 HEALTH ISSUES IN EMPLOYEE ASSISTANCE PROGRAMS (3) An introduction to health promotion strategies in employee assistance programs. Prerequisite: KINES 060, KINES 443
BB H 446 HUMAN SEXUALITY AS A HEALTH CONCERN (3) Examination of human sexuality as a integral part of basic health education and health care for persons of all ages. Prerequisite: BB H 101
BB H 451 PHARMACOLOGICAL INFLUENCES ON HEALTH (3) Biological and behavioral aspects of therapeutic and recreational drug use and misuse, and their relationships to health. Prerequisite: BB H 101
BB H 452 (NURS;WMNST) WOMEN'S HEALTH ISSUES (3) Exploration of major health issues concerning women today, with an emphasis on social, cultural, and medical influences. Prerequisite: BB H 101, BIOL 141
BB H 453 ORIENTATION TO THE HEALTH EDUCATION PRACTICUM (1) Orientation to and preparation for the health field experience. Prerequisite: sixth-semester standing
BB H 458 (WMNST) CRITICAL ISSUES IN REPRODUCTION (3) Examination and analysis of the new reproductive technologies from the standpoint of medical ethics, feminism, and sociocultural influences. Prerequisite: BIOL 141 or PSY 002
BB H 468 NEUROANATOMICAL BASES FOR DISORDERS OF BEHAVIOR AND HEALTH (3) An examination of the anatomical/cellular/molecular bases for human central nervous system disorders and their impacts on victims/families/caregivers. Prerequisite: BB H 368, BB H 469 OR PSY 203
BB H 469 (BIOL) NEUROBIOLOGY (3) Comprehensive examination of neuroanatomy and physiology designed to integrate the principles of neurochemistry, neuroendocrinology and molecular biology. Prerequisite: BIOL 240W
BB H 470 (BIOL) FUNCTIONAL AND INTEGRATIVE NEUROSCIENCE (3) Neurobiological function in motivated behaviors, motor and sensory function, learning and memory, development, sexual differentiation, and pathology. Prerequisite: BIOL 469
BB H 494 RESEARCH PROJECT (1–12)
BB H 496 INDEPENDENT STUDIES (1–18)
BB H 497 SPECIAL TOPICS (1–9)

BIOCHEMISTRY AND MOLECULAR BIOLOGY (B M B)

Eberly College of Science

B M B 001(GN) UNDERSTANDING THE BASES OF HUMAN DISEASE (3) A broad survey of the molecular and cellular factors that provide an explanation for an understanding of human disease.
B M B 001S (GN) UNDERSTANDING THE BASES OF HUMAN DISEASE (3) A broad survey of the molecular and cellular factors that provide an explanation for an understanding of human disease.
B M B 199 (GI) FOREIGN STUDIES (1–12)
B M B 211 ELEMENTARY BIOCHEMISTRY (3) An overview of biochemistry that includes properties of biomolecules, bioenergetics, metabolism, nutrition, genetics, and molecular biology. Prerequisite: CHEM 012; CHEM 034 or CHEM 038
B M B 212 ELEMENTARY BIOCHEMISTRY LABORATORY (1) Selected experiments to illustrate major biochemical principles and techniques. Prerequisite: or concurrent: B M B 211
B M B 221 APPLIED BIOCHEMISTRY (2) Application and correlation of biochemical events to physiological-nutritional processes in specialized cells, fluids, and whole animals. Students may not receive credit for both B M B 221 and 401. Prerequisite: B M B 211
B M B 251 (MICRB) MOLECULAR AND CELL BIOLOGY I (3) Biomolecules, genetic mechanisms, organization of cells and their organelles, DNA replication, protein synthesis, membranes, the cell nucleus, energy conversion. Prerequisite: CHEM 013
B M B 252 (MICRB) MOLECULAR AND CELL BIOLOGY II (3) Continuation of B M B/MICRB 251; cytoskeleton, cell growth, division, adhesion, signalling, germ cells, differentiation, immune system, nervous system, plant cells. Prerequisite: B M B 251
B M B 342 (MICRB) LABORATORY IN PROTEINS, NUCLEIC ACIDS, AND MOLECULAR CLONING (3) Laboratory in enzyme purifications and assay techniques; nucleic acid isolation and characterization, including plasmid preparation. Prerequisite: B M B 251, BIOL 230W, or MICRB 201; CHEM 034 or CHEM 038. Prerequisite or concurrent: B M B 211 or B M B 401
B M B 399 (GI) FOREIGN STUDIES (1–12)
B M B 400 MOLECULAR BIOLOGY OF THE GENE (3) Biochemistry of genetic phenomena, including the structure, replication and dynamics of genes and chromosomes, their expression and regulation. Prerequisite: BIOL 222; BIOL 230W or B M B 251; CHEM 039
B M B 401 GENERAL BIOCHEMISTRY (2) Principles of the structure and function of biological molecules, including carbohydrates, lipids, membranes, proteins, and enzymes. Prerequisite: CHEM 039; B M B 251 OR BIOL 230
B M B 402 GENERAL BIOCHEMISTRY (3) Comprehensive survey of the pathways and regulation of intermediary metabolism. Prerequisite: B M B 401

B M B 408 LABORATORY INSTRUCTIONAL PRACTICE (1–2) Participation in the instruction of undergraduate laboratory courses, including classroom preparation; discussion of principles and objectives of each exercise. Prerequisite: 10 credits in biochemistry and molecular biology and permission of the department
B M B 411 SURVEY OF BIOCHEMISTRY AND MOLECULAR BIOLOGY LITERATURE (1) An introduction to readings and oral presentations in biochemistry and molecular biology. Prerequisite: B M B 401; B M B 400 OR B M B 402
B M B 428 PHYSICAL CHEMISTRY WITH BIOLOGICAL APPLICATIONS (3) Chemical thermodynamics and kinetics with applications to biological problems. Prerequisite: CHEM 035 or CHEM 039; PHYS 203 or PHYS 251; 3 credits in cell biology
B M B 430 (BIOL;ENT) DEVELOPMENTAL BIOLOGY (3) Molecular and genetic analyses of mechanisms involved in differentiation and determination in biological systems. Prerequisite: BIOL 222; B M B 252 OR BIOL 230
B M B 432 (MICRB;V SC) ADVANCED IMMUNOLOGY: SIGNALING IN THE IMMUNE SYSTEM (3) The study of signaling pathways that regulate the immune response. Prerequisite: B M B 400, MICRB 410
B M B 433 (V SC) MOLECULAR AND CELLULAR TOXICOLOGY (3) In-depth coverage of processes by which drugs/chemicals interact with biological systems and the experimental approaches used to study these interactions. Prerequisite: B M B 401
B M B 435 (MICRB;V SC) VIRAL PATHOGENSIS (2) A study of the molecular, immunological and pathological aspects of viral diseases as well as laboratory methods of diagnosis. Prerequisite: MICRB 201; B M B 251 and B M B 252 or BIOL 110 and BIOL 230W
B M B 437 PHYSIOLOGICAL BIOCHEMISTRY (2) Physiological aspects of biochemistry, with emphasis on mammalian metabolism, specialized tissue and fluid functions, detoxification mechanisms, energetics, and physiological interrelationships. Prerequisite: B M B 402
B M B 443W LABORATORY IN PROTEIN PURIFICATION AND ENZYMOLOGY (3) Laboratory in protein isolation methodology, enzyme kinetics, and physico- chemical properties of proteins. Prerequisite: B M B 342, B M B 401
B M B 444 LABORATORY IN CARBOHYDRATES AND LIPIDS (1) Laboratory in the isolation, quantification, and characterization of carbohydrates and lipids. Prerequisite: B M B 342, B M B 401
B M B 445W LABORATORY IN MOLECULAR GENETICS I (2) Laboratory in molecular techniques in gene analysis and microbial genetics, emphasizing in vitro methodologies. Prerequisite: B M B 342, B M B 400, MICRB 202
B M B 446 LABORATORY IN MOLECULAR GENETICS II (1) Laboratory in gene analysis and microbial genetics, emphasizing in vivo methodologies. Prerequisite: B M B 342, B M B 400, MICRB 202
B M B 450 (MICRB) MICROBIAL/MOLECULAR GENETICS (2) Genetic phenomena, with emphasis on molecular mechanisms: gene transfer, recombination, gene conversion, gene fusion, suppression, transposons. Prerequisite: BIOL 222, MICRB 201
B M B 460 (MICRB) CELL GROWTH AND DIFFERENTIATION (2) Mechanisms and regulation of protein trafficking and organelle biosynthesis, cell signalling, cell cycle control, and cell development. Prerequisite: B M B 252
B M B 464 MOLECULAR MEDICINE (3) An exploration of the impact of advances in molecular biology on understanding disease mechanisms, medical diagnosis, and therapeutics. Prerequisite: B M B 251
B M B 474 PROPERTIES OF BIOLOGICAL MACROMOLECULES (2) Physical/chemical theory and techniques with emphasis on proteins and nucleic acids: solutions, chromatography, electrophoresis, viscosity, diffusion, sedimentation, spectroscopy, isotopes. Prerequisite: B M B 428 or CHEM 451
B M B 480 (MICRB) TUMOR VIRUSES AND ONCOGENES (3) Oncogenes, DNA and RNA tumor viruses, and relevant experimental techniques with emphasis on molecular basis of carcinogenesis and gene regulation. Prerequisite: or concurrent: MICRB 415, MICRB 435, or MICRB 460
B M B 496 INDEPENDENT STUDIES (1–18)
B M B 497 SPECIAL TOPICS (1–9)
B M B 498 SPECIAL TOPICS (1–9)
B M B 499 (GI) FOREIGN STUDIES (1–12)

BIOENGINEERING (BIOE)

College of Engineering

BIOE 100S BIOENGINEERING SEMINAR (1) First-year seminar to introduce the role of engineering in biomedical research and in instrument development for the medical device industry.
BIOE 201 ANALYSIS OF MOLECULES AND CELLS (3) An analytical study of molecular and cellular phenomena including functional and metabolic interactions. Prerequisite: BIOL 141, CHEM 013, MATH 141, PHYS 212
BIOE 301 ANALYSIS OF PHYSIOLOGICAL SYSTEMS (3) Linear systems analysis applied to electrical networks and lumped parameter models of physiological control systems. Prerequisite: BIOL 141, PHYS 212, MATH 250 or MATH 251
BIOE 302 PHYSIOLOGICAL SIMULATION LABORATORY (1) Computer laboratory designed to illustrate applications of control systems theory to physiological systems. Prerequisite: or concurrent: BIOE 301
BIOE 303 BIO-CONTINUUM MECHANICS (3) Mechanical properties of fluids and solids with applications to tissue mechanics and vascular system. Prerequisite: BIOL 141, E MCH 210, MATH 251

BIOE 313 BIOENGINEERING TRANSPORT PHENOMENA I (3) A mathematical presentation of the fundamentals of chemical processes, with emphasis on physiological applications. Prerequisite: BIOL 141, CHEM 013, MATH 251
BIOE 401 INTRODUCTION TO BIOENGINEERING (3) Application of fluid mechanics, mass transfer, electrical theory, and control theory to physiological systems and internal artificial organs. Prerequisite: MATH 250, PHYS 212. Prerequisite or concurrent: BIOL 141 or BIOL 472
BIOE 402 BIOMEDICAL INSTRUMENTATION AND MEASUREMENTS (3) Biomedical measurements, including consideration of techniques, equipment, and safety. Prerequisite: MATH 250, 3 credits of electrical circuits
BIOE 403 BIOMEDICAL INSTRUMENTATION LABORATORY (1) Biomedical measurements laboratory including measurement of bioptentials, experiments in medical imaging techniques, and use of cardiovascular and pulmonary system instrumentation. Prerequisite: BIOE 402
BIOE 406 MEDICAL IMAGING (3) Physical principles and clinical applications of medical imaging methods. Prerequisite: PHYS 212
BIOE 413 BIOENGINEERING TRANSPORT PHENOMENA II (3) An integrated study of the fundamentals of mass and heat transport processes with emphasis on the analysis of physiological systems. Prerequisite: BIOE 303, MATH 251
BIOE 419 ARTIFICIAL ORGANS AND PROSTHETIC DEVICES (3) Analysis of function and consideration of design concerns for biomedical implants, including prosthetic joints, electrical stimulators, and cardiovascular pumps. Prerequisite: MATH 250. Prerequisite or concurrent: BIOL 141 or BIOL 472
BIOE 423 BIOENGINEERING TRANSPORT PHENOMENA III (3) Chemical kinetics and reaction equilibria with applications to the analysis of physiological function and the design of synthetic organs. Prerequisite: BIOL 141, BIOE 313 or CH E 301. Prerequisite or concurrent: BIOE 413 or CH E 302 and CH E 413
BIOE 433 BIOTRANSPORT—PROBLEM BASED LEARNING (3) Application of fluid mechanics, heat transfer, and mass transfer to problems in medicine and biology using a problem-based learning approach. Prerequisite: BIOE 313, BIOE 413
BIOE 440 CLINICAL CORELATIONS (1) Engineering analysis applied to common disease states and therapies. Prerequisite: BIOE 402
BIOE 450W BIOENGINEERING SENIOR DESIGN (3) Application of engineering and physiological principles to design of artificial organs and life supportive devices. Prerequisite: BIOE 440, ENGL 202C, senior standing
BIOE 490 COLLOQUIUM (1) Technical presentations related to research and industry concerns, and by students doing senior projects. Prerequisite: or concurrent: BIOE 450W
BIOE 496 INDEPENDENT STUDIES (1–18)
BIOE 497 SPECIAL TOPICS (1–9)

BIOLOGICAL SCIENCE (BI SC)

Eberly College of Science

BI SC 001 (GN) STRUCTURE AND FUNCTION OF ORGANISMS (3) An exploration of cellular components and processes and their contribution to the structure and function of living organisms. Students who have passed BIOL 027, 041, or 102 may not schedule this course.
BI SC 002 (GN) GENETICS, ECOLOGY, AND EVOLUTION (3) How living organisms pass on their inheritance, how plants and animals came to be what they are, and how they now react. Students who have passed BIOL 033, 101, 102, or 222 may not schedule this course.
BI SC 003 (GN) ENVIRONMENTAL SCIENCE (3) Kinds of environments; past and present uses and abuses of natural resources; disposal of human wastes; prospects for the future. Students who have passed BIOL 210 or any other upper-level ecology course in biology may not schedule this course.
BI SC 004 (GN) HUMAN BODY: FORM AND FUNCTION (3) A general survey of structure and function—from conception, through growth and reproduction, to death. Students who have passed BIOL 029 and 041 may not schedule this course.

BIOLOGY (BIOBD)

Penn State Erie, The Behrend College

BIOBD SPECIAL TOPICS (1–9)
BIOBD 125 INTRODUCTORY BIOLOGY SEMINAR (1) Current topics in biodiversity and organic evolution. Concurrent: BIOL 110
BIOBD 150 HEALTH SCIENCES SEMINAR (1) Presentation and exploration of a variety of career choices in the biomedical health sciences.
BIOBD 197 SPECIAL TOPICS (1–9)
BIOBD 199 (GI) FOREIGN STUDIES (1–12)
BIOBD 225 MOLECULAR AND CELL BIOLOGY SEMINAR (1) Current topics in molecular and cell biological research focusing on techniques. Concurrent: BIOL 230W
BIOBD 250 PRE-MED SEMINAR (1) Presentation and discussion of requirements, approaches, and expectations for a career in medicine. Prerequisite: third-semester standing
BIOBD 296 INDEPENDENT STUDIES (1–18)
BIOBD 297 SPECIAL TOPICS (1–9)

BIOBD 301H SCHOLARS SEMINAR IN BIOLOGY (1) Schreyers Scholars students doing honors thesis receive instruction on primary literature reviews, experimental design, research grant and thesis proposal preparation. Prerequisite: Junior standing in biology and enrollment in Schreyer's Honors Program

BIOBD 322 GENETIC ANALYSIS (3) A discussion of the mechanisms of heredity in prokaryotes and eukaryotes with emphasis on analysis and modes of inference. Prerequisite: at least two of the following courses: BIOL 220W, BIOL 230W, BIOL 240W, or MICRB 201

BIOBD 380 INTRODUCTION TO SCANNING ELECTRON MICROSCOPY (2) Theory of scanning electron microcopy, specimen preparation and basic familiarity with use of scanning electron microscope. Prerequisite: BIOL 110; CHEM 015

BIOBD 397 SPECIAL TOPICS (1–9)

BIOBD 399 (GI) FOREIGN STUDIES (1–12)

BIOBD 401W BIOLOGICAL EXPERIMENTAL DESIGN (3) Discussion of experimental design, analysis and presentation, with a practicum providing for student design, analysis and presentation of biological experiments. Students may not take this course if they have taken BIOBD 350W. Prerequisite: at least two of the following three courses: BIOL 220W, BIOL 230W, BIOL 240W; STAT 250

BIOBD 410 LIMNOLOGY (3) The interrelations of physical, chemical, and biotic factors in fresh-water habitats; intensive studies of local lakes and streams. Prerequisite: BIOL 220W

BIOBD 412 BEHAVIORAL ECOLOGY (3) Theories of behavioral ecology including examples from vertebrate and invertebrate taxa. Prerequisite: BIOL 220W, BIOL 240W

BIOBD 413 VERTEBRATE FIELD BIOLOGY (3) Field observations, collections, identification, and classification of vertebrates from local habitats. Special attention given to life histories and ecology. Prerequisite: BIOL 220W

BIOBD 415 CURRENT ISSUES IN WETLANDS (3) A discussion of wetlands hydrology and biology, emphasizing conservation and mitigation issues, and investigative laboratories involving both plants and animals. Prerequisite: BIOL 220W

BIOBD 419 POPULATION ECOLOGY (3) Theoretical discussions of demographics, population and metapopulation growth models, life histories, and species interactions such as competition, predation, host-parasitoid relationships. Prerequisite: BIOL 220W, MATH 140, STAT 250

BIOBD 420 COMPARATIVE ANATOMY (4) Comparative anatomy of selected vertebrate animals, emphasizing structural adaptations. Prerequisite: BIOL 240W

BIOBD 424 ANIMAL HISTOLOGY (3) Microscopic structure of tissues and organs with emphasis on those of mammals, structure-function relationships, histotechnology, including histochemistry. Prerequisite: BIOL 240W

BIOBD 425 MEDICAL GENETICS (3) Recent developments in human heredity, cytogenetics, clinical genetics, prenatal diagnosis, and genetic counseling. Prerequisite: BIOBD 322 or BIOL 222

BIOBD 426 EVOLUTIONARY GENETICS (3) Current genetic research in evolution, both population and molecular, providing a basis for understanding the mechanisms of evolution. Prerequisite: BIOBD 322 or BIOL 222

BIOBD 429 UNIFYING CONCEPTS IN BIOLOGY (2) Selected unifying evolutionary concepts in biology including natural selection, microevolution, adaptation, macroevolution, coevolution, biogeography, and human evolution. Prerequisite: BIOBD 322 or BIOL 222

BIOBD 430A CLINICAL MICROBIOLOGY (6) Identification and clinical pathology of bacteria and viruses; techniques to collect, culture, isolate, and determine antimicrobial susceptibility. Prerequisite: seventh-semester standing in the Medical Technology option of the Penn State Erie Biology major

BIOBD 430B CLINICAL URINALYSIS (3) Principles of urine analysis to include anatomy and physiology of the urinary system, microscopic urinary structures, physical and chemical characteristics of urine, pregnancy tests, clinical correlation, and evaluation procedures. Prerequisite: seventh-semester standing in the Medical Technology option of the Penn State Erie Biology major

BIOBD 430C CLINICAL CHEMISTRY (7) Principles of instrumentation, radioimmunoassay, specimen collection and preservation; enzymology, endocrinology, biochemistry of lipids and proteins, toxicology, clinical correlation, and quality control. Prerequisite: seventh-semester standing in the Medical Technology option of the Penn State Erie Biology major

BIOBD 430D CLINICAL HEMATOLOGY AND COAGULATION (4) The composition and functions of blood, diseases related to blood disorders, the role of platelets and coagulation; manual and automated techniques of diagnostic tests for abnormalities. Prerequisite: seventh-semester standing in the Medical Technology option of the Penn State Erie Biology major

BIOBD 430E CLINICAL IMMUNOLOGY AND SEROLOGY (4) Basic principles of immunology and serology which are involved in the diagnosis of diseases. Prerequisite: seventh-semester standing in the Medical Technology option of the Penn State Erie Biology major

BIOBD 430F CLINICAL IMMUNOHEMATOLOGY (4) Blood antigens, antibodies, crossmatching, hemoloytic diseases, and related diagnostic tests; immunogenetics and HLA system compatibility testing, and quality control used in blood banking. Prerequisite: seventh-semester standing in the Medical Technology option of the Penn State Erie Biology major

BIOBD 430G CLINICAL PARASITOLOGY (1) Principles of clinical parasitology to include intestinal and urogenital protozoa, amoeba, blood parasites, helminths, and arthropods affecting humans. Prerequisite: seventh-semester standing in the Medical Technology option of the Penn State Erie Biology major

BIOBD 430I CLINICAL MYCOLOGY (1) Clinical mycology including dermatophytes, medically important yeasts, and serodiagnosis of fungal diseases. Prerequisite: seventh-semester standing in the Medical Technology option of the Penn State Erie Biology major
BIOBD 430K CLINICAL SEMINAR (1) Basic principles of education, curriculum development, and management techniques applied to a clinical situation. Prerequisite: seventh-semester standing in the Medical Technology option of the Penn State Erie Biology major
BIOBD 445 DEVELOPMENTAL PLANT BIOLOGY (3) Developmental mechanisms associated with biological processes of vascular plants. Prerequisite: BIOL 240W
BIOBD 446 PLANT FUNCTIONS (4) Introduction of the experimental basis for our understanding of higher plant functions, including nutrition, water relations, and development. Prerequisite: BIOL 230W, BIOL 240W; CHEM 034 OR CHEM 038
BIOBD 449 DEVELOPMENTAL ANIMAL BIOLOGY (3) The problems of differentiation, morphogenesis, growth, and reproduction of animals. Prerequisite: BIOL 230W, BIOL 240W
BIOBD 452 CELLULAR BIOCHEMISTRY (3) Principles of bioenergetics, metabolic pathways, biosynthesis of biomolecules, hormonal regulation, and information pathways. Prerequisite: CHMBD 451 or BIOL 230W and CHEM 039
BIOBD 453 (CHMBD) BIOCHEMISTRY LABORATORY (1) An introduction to techniques of experimental biochemistry, illustrating principles covered in BIOBD/CHMBD 452. Prerequisite: or concurrent: BIOBD 452
BIOBD 455 ANIMAL PARASITOLOGY (3) Exploration of the taxonomy, life-cycles, and ecology of animal parasites. Prerequisite: BIOL 240W
BIOBD 459 FRESHWATER AND TERRESTRIAL INVERTEBRATES (4) Examination of structure, function, behavior, and ecology of free-living and symbiotic invertebrates occurring in various freshwater and terrestrial habitats. Prerequisite: BIOL 220W, BIOL 240W
BIOBD 460 MOLECULAR BIOLOGY (3) A discussion of current aspects of cell molecular biology with a laboratory emphasizing current biotechnology techniques. Prerequisite: BIOL 230W, BIOL 240W
BIOBD 465 PROTEIN STRUCTURE AND FUNCTION (3) A study of the relationship between structure and function of proteins; internet analysis to predict structure and function is included. Prerequisite: BIOL 230W
BIOBD 469 ANIMAL PHYSIOLOGY (3) Mammalian body functions; emphasis on humans with selected comparisons to other animals. Prerequisite: BIOL 240W; CHEM 035 OR CHEM 036
BIOBD 494A SENIOR SEMINAR IN BIOLOGY (1) Discussion of selected topics from recent biological literature; reports on current research or internship experiences. Prerequisite: 18 credits in Biology; seventh-semester standing
BIOBD 494B JUNIOR-SENIOR RESEARCH IN BIOLOGY (1–12) An opportunity for Biology majors to apply investigative skills in an extended research project under faculty supervision.
BIOBD 495 INTERNSHIP IN BIOLOGY (3–12) Practical off-campus experience in Biology under the supervision of a professional and a faculty member.
BIOBD 496 INDEPENDENT STUDIES (1–18)
BIOBD 497 SPECIAL TOPICS (1–9)
BIOBD 498 SPECIAL TOPICS (1–9)

BIOLOGY (BIOL)

Eberly College of Science

*BIOL 011 (GN) INTRODUCTORY BIOLOGY I (3) An introduction to fundamental biological topics (including cells, energy transduction, genetics, evolution, organismal structure/function, ecology) for non-majors biology-related fields.
*BIOL 012 (GN) INTRODUCTORY BIOLOGY II (1) Laboratory exercises demonstrating principles of biology. Prerequisite: or concurrent: BIOL 011
BIOL 020 (GN;GI) PLANTS, PLACES, AND PEOPLE (3) Useful and dangerous plants; historical (archaeological), cultural (ethnological), and economic (anthropocentric) aspects, including structural and chemical characteristics of botanical importance. Students who have passed BIOL (PPATH;STS) 424 may not schedule this course.
BIOL 027 (GN) INTRODUCTION TO PLANT BIOLOGY (3) Cellular structure and organization; physiological processes; classification; reproduction and development; relationship of plant groups. Students who have passed BIOL 240W may not schedule this course.
BIOL 033 (GN) GENETICS AND EVOLUTION OF THE HUMAN SPECIES (3) Human heredity and evolution, individual and social implications. The course is for non-majors; students who have passed BIOL 222, 230W, B M B 251 or any upper-division biology course may not schedule this course.
BIOL 055 (GN) INTRODUCTION TO THE BIOLOGY OF AGING (3) Examination of human aging from a biological perspective. Population demographics, physiological and pathological changes, and healthy lifestyles are discussed. Students who have passed BIOL 409 may not schedule this course.
BIOL 110 (GN) BIOLOGY: BASIC CONCEPTS AND BIODIVERSITY (4) A study of the evolution of the major groups of organisms including the fundamental concepts of biology.
BIOL 110L (GN) BIOLOGY: BASIC CONCEPTS AND BIODIVERSITY (4) A study of the evolution of the major groups of organisms including the fundamental concepts of biology.
BIOL 110P (GN) BIOLOGY: BASIC CONCEPTS AND BIODIVERSITY A study of the evolution of the major groups of organisms including the fundamental concepts of biology.

BIOL 110S (GN) BIOLOGY: BASIC CONCEPTS AND BIODIVERSITY (4) A study of the evolution of the major groups of organisms including the fundamental concepts of biology. This course also fulfills the First-Year Seminar requirements.
BIOL 129 (GN) MAMMALIAN ANATOMY (4) Anatomy of a mammal, with special reference to that of man. Students who have passed BIOL 421 may not schedule this course.
BIOL 129L MAMMALIAN ANATOMY (4) Anatomy of a mammal, with special reference to that of man. Students who have passed BIOL 421 may not schedule this course.
BIOL 129P MAMMALIAN ANATOMY Anatomy of a mammal, with special reference to that of man. Students who have passed BIOL 421 may not schedule this course.
BIOL 141 (GN) INTRODUCTORY PHYSIOLOGY (3) Explanation of the normal structure and function of the animal body, with special emphasis on human body systems. Students who have passed BIOL 472 may not schedule this course.
BIOL 142 PHYSIOLOGY LABORATORY (1) Experiments demonstrating basic physiological principles, with special reference to man. Prerequisite: or concurrent: BIOL 141
BIOL 199 (GI) FOREIGN STUDIES (1–12)
BIOL 200 INTRODUCTION TO PHARMACOLOGICAL CONCEPTS (3) Presents basic concepts of pharmacology; includes major drug classifications, pharmaceutical preparations, and biological implications relevant to these therapeutic agents.
+BIOL 220W (GN) BIOLOGY: POPULATIONS AND COMMUNITIES (4) A study of the structures and functions of organismic interactions from simple populations to complex ecosystems. (BIOL 220W, 230W, and 240W each carry only 1 credit of "writing"; all three courses must be taken to meet the writing requirement.) Prerequisite: BIOL 110
BIOL 220X (GN) BIOLOGY: POPULATIONS AND COMMUNITIES (4) A study of the structures and functions of organismic interactions from simple populations to complex ecosystems. (BIOL 220W, 230W, and 240W each carry only 1 credit of "writing"; all three courses must be taken to meet the writing requirement.) Prerequisite: BIOL 110
BIOL 222 GENETICS (3) Variation and heredity in plants and animals, including man; relationships of genetical knowledge to evolution and breeding practices. Prerequisite: 3 credits in biological sciences
BIOL 223 LABORATORY IN GENETICS (1) Principles of genetics illustrated with Drosophila breeding experiments and with demonstrations of plant and animal materials. Prerequisite: BIOL 033 or BIOL 222
+BIOL 230W (GN) BIOLOGY: MOLECULES AND CELLS (4) A study of cellular phenomena including molecular genetics and metabolic interactions. (BIOL 220W, 230W, and 240W each carry only 1 credit of "writing"; all three courses must be taken to meet the writing requirement.) Prerequisite: BIOL 110, CHEM 012
+BIOL 240W (GN) BIOLOGY: FUNCTION AND DEVELOPMENT OF ORGANISMS (4) A study of development and physiological processes at the organismic level. (BIOL 220W, 230W, and 240W each carry only 1 credit of "writing"; all three courses must be taken to meet the writing requirement.) Prerequisite: BIOL 110, CHEM 012
BIOL 296 INDEPENDENT STUDIES (1–18)
BIOL 297 SPECIAL TOPICS (1–9)
BIOL 341 (GN) BIOLOGY OF SEX (3) Basic structure and function of the human reproductive system. Physiology of gametogenesis, fertilization, contraception, gestation, parturition, lactation, and sexual behavior.
BIOL 399 (GI) FOREIGN STUDIES (1–12)
BIOL 400 TEACHING IN BIOLOGY (2) This course will train biology teaching assistants to teach in the laboratory/ recitation setting with emphasis on critical thinking skills. Enrollment will be limited to students of at least fifth semester standing that have been accepted as teaching assistants for biology. Prerequisite: BIOL 110, BIOL 220W, BIOL 230W, BIOL 240W; or at least 12 credits of equivalent biology courses
BIOL 401 GENETIC ANALYSIS OF MODEL SYSTEMS (3) Survey of tools and techniques available for genetic analysis with bacteria, Neurospora, yeast, Drosophila, C. elegans, Arabidopsis, maize, mice, and humans. Prerequisite: BIOL 230W and B M B 400 or B M B 401; or concurrent: B M B 400 or B M B 401
BIOL 403 LABORATORY METHODS FOR GENETIC ANALYSIS (2) Survey of tools and techniques available for genetic analysis with bacteria, Neurospora, yeast, Drosophila, C. elegans, Arabidopsis, maize, mice, and humans. Prerequisite: BIOL 230W Concurrent: B M B 400 or B M B 401
BIOL 404 CELLULAR MECHANISMS IN VERTEBRATE PHYSIOLOGY (3) This course considers cellular mechanisms governing physiological aspects of vertebrate cell signaling and their adaptation to particular organismal functions. Prerequisite: B M B 251 or BIOL 230W
BIOL 405 MOLECULAR EVOLUTION (3) Introduction to concepts and techniques of analysis of molecular sequence data from an evolutionary point of view. Prerequisite: BIOL 222 or BIOL 230W
BIOL 406 SYMBIOSIS (3) This course covers a variety of different types of symbiotic relationships between unicellular symbionts and plants, fungi, or animals. Prerequisite: BIOL 110; BIOL 220W, BIOL 230W, or BIOL 240W
BIOL 407 PLANT ANATOMY (3) Structure of leaves, stems, roots, and flowers of vascular plants. Prerequisite: BIOL 240W
BIOL 408 CONTRIBUTIONS OF WOMEN TO THE BIOLOGICAL SCIENCES: PAST AND PRESENT (3) A study of the contributions that women scientists have made and continue to make in the biological sciences. Prerequisite: BIOL 220W, BIOL 230W, OR BIOL 240W
BIOL 409 BIOLOGY OF AGING (3) Mechanisms of the aging process, with special reference to man.

Unfavorable progressive changes in molecules, cells, systems, and organisms. Prerequisite: 6 credits in biology
BIOL 410 MOLECULAR BASIS OF PLANT DEVELOPMENT (3) A discussion of how genetic engineering is applied to understanding and modifying plant development. Prerequisite: BIOL 222, BIOL 240W; B M B 211 or B M B 400, B M B 401
BIOL 411 MEDICAL EMBRYOLOGY (3) Develops an understanding of human reproductive physiology, embryological processes, their time frames, and the development of major human body systems. The course emphasizes clinical correlations and the medical consequences of developmental abnormalities. Prerequisite: 6 credits of biology
BIOL 412 ECOLOGY OF INFECTIOUS DISEASES (3) This course examines how ecological processes impact upon the epidemiology of infectious diseases. Prerequisite: BIOL 220W or H P A 440
BIOL 413 CELL SIGNALING AND REGULATION (3) Introduction to the themes of cellular signaling and regulation through critical review of primary literature. Prerequisite: BIOL 240W
BIOL 414 TAXONOMY OF SEED PLANTS (3) Basic principles and procedures in the practice of angiosperm systematics. Prerequisite: BIOL 240W
BIOL 415 ECOTOXICOLOGY (3) Major concepts and controversies in the interdisciplinary field of ecological toxicology; toxicity analysis, remediation, and case studies of environmental pollution. Prerequisite: BIOL 110, BIOL 220W; FOR 308 OR W F S 209
BIOL 416 BIOLOGY OF CANCER (3) This course intends to illustrate biological basis of cancer development, and discusses aspects on prevention, detection, and treatment of cancer. Prerequisite: BIOL 222 or BIOL 230W
BIOL 417 INVERTEBRATE ZOOLOGY (4) Function and form of major invertebrate phyla. Prerequisite: BIOL 110
BIOL 419 ECOLOGICAL AND ENVIRONMENTAL PROBLEM SOLVING (3) Overview of processes involved in solving environmental problems. Provides students with toolkit for understanding ecological and environmental problems. Prerequisite: BIOL 220W
BIOL 420 PALEOBOTANY (3) Classification, morphology, phylogeny, and stratigraphic occurrence of fossil plants; practicum includes field trips and study of paleobotanical techniques and specimens. Prerequisite: any 3 credit introductory course in historical geology or plant biology
BIOL 421 COMPARATIVE ANATOMY OF VERTEBRATES (4) The comparative anatomy of representative vertebrate animals. Prerequisite: BIOL 240W
BIOL 422W ADVANCED GENETICS (3) Chromosomal mechanism of heredity; cytoplasmic and polygenic inheritance, chemical genetics, and experimental evolution. Prerequisite: BIOL 033 or BIOL 222 or BIOL 230W
BIOL 423 INTRODUCTORY PALYNOLOGY (4) Morphology, taxonomy, stratigraphy, and paleoecology of fossil palynomorphs; practicum—study of modern pollen and spores and analysis of sedimentary rocks. Prerequisite: any 3-credit introductory course in historical geology or plant biology
BIOL 424 (PPATH;S T S) SEEDS OF CHANGE: THE USES OF PLANTS (3) Interdisciplinary approach to the biology, chemistry, history, and culture of the interactions between plants and people. Prerequisite: BIOL 110; BIOL 220W, BIOL 230W, or BIOL 240W
BIOL 425 (PPATH) BIOLOGY OF FUNGI (4) A survey of the biological diversity of fungi, stressing evolution, ecololgy, disease, morphology, life histories, and importance to human affairs. Prerequisite: fifth-semester or graduate standing in a biological sciences major, with six credits completed in the major
BIOL 426 DEVELOPMENTAL NEUROBIOLOGY (3) Overview of basic developmental processes as they apply to the central nervous system. Prerequisite: BIOL 141 or BIOL 240
BIOL 427 (GEOSC) EVOLUTION (3) Selected topics on the evolution of life. Prerequisite: BIOL 220W, BIOL 230W
BIOL 428 POPULATION GENETICS (3) Mathematical formulation of evolution by natural selection, genetic equilibrium under selection, mutation, migration, random drift. Prerequisite: BIOL 220W, STAT 250; MATH 111 or MATH 141
BIOL 429 ANIMAL BEHAVIOR (3) Physiological mechanisms, ecological relevance, and adaptive significance of animal behavior. Prerequisite: BIOL 110, BIOL 220W
BIOL 430 (B M B;ENT) DEVELOPMENTAL BIOLOGY (3) Molecular and genetic analyses of mechanisms involved in differentiation and determination in biological systems. Prerequisite: B M B 252; or BIOL 222, BIOL 230W
BIOL 431 COMPARATIVE PLANT MORPHOLOGY (4) Origin, structure, development, reproduction, and evolutionary relationships of plants and fungi. Prerequisite: BIOL 240W
BIOL 432 DEVELOPMENTAL GENETICS (3) An advanced course in developmental biology, focusing on the use of genetics techniques to study fundamental questions of animal development. Prerequisite: BIOL 230W; or B M B 251, B M B 252
BIOL 435 ECOLOGY OF LAKES AND STREAMS (3) Physical, chemical, and biological characteristics of freshwater environments, with special emphasis on factors regulating productivity in freshwater ecosystems. Prerequisite: BIOL 220W
BIOL 436 POPULATION ECOLOGY AND GLOBAL CLIMATE CHANGE (3) Ecological responses of individuals, populations, and communities to environmental variation, with emphasis on climate change. Prerequisite: BIOL 220
BIOL 437 HISTOLOGY (4) Microscopic structure of the tissue of the animal body. Prerequisite: BIOL 230W
BIOL 439 PRACTICAL BIOINFORMATICS (3) Practical aspects of retrieving and analyzing biological information residing in common databases. Prerequisite: BIOL 230 or B M B 251

BIOL 440 EMBRYOLOGY (4) Origin and development of the various tissues and organs of the animal body. Prerequisite: BIOL 240W

BIOL 441 PLANT PHYSIOLOGY (3) Classical and current concepts in plant constituents, mineral nutrition, water relations, respiration, photosynthesis, photoperiodism, plant hormones, growth, and development. Prerequisite: BIOL 230W, BIOL 240W

BIOL 442 PLANT PHYSIOLOGY (3) Techniques and fundamentals of classical and current experimental plant physiology, with emphasis in those areas studied in BIOL 441. Laboratory. Prerequisite: BIOL 240W, BIOL 407, or BIOL 441

BIOL 443 EVO-DEVO: EVOLUTION OF DEVELOPMENTAL MECHANISMS (3) How evolution of animals and plants can be traced to changes in the regulation and/or interactions of genes controlling development. Prerequisite: BIOL 240

BIOL 444 FIELD ECOLOGY OF THE CENTRAL APPALACHIAN HIGHLANDS (3) This field course will examine the terrestrial flora and fauna of the central Appalachian highlands. Prerequisite: BIOL 220W

BIOL 446 PHYSIOLOGICAL ECOLOGY (3) The physiological abilities of plants and animals to adapt to their abiotic environment. Prerequisite: BIOL 220W, BIOL 240W

BIOL 448 ECOLOGY OF PLANT REPRODUCTION (3) Analysis of the ecology, evolution, and natural history of angiosperm reproduction, including pollination, fruit-set, dispersal, and relevant plant- animal interactions. Prerequisite: BIOL 220W

BIOL 450W EXPERIMENTAL FIELD BIOLOGY (5) A practical introduction to modern experimental techniques for ecological study of terrestrial, marine, and fresh water habitats. Prerequisite: BIOL 220W, BIOL 240W

BIOL 454 HERPETOLOGY (2) The biology of reptiles and amphibians. Prerequisite: BIOL 110

BIOL 459 (BIOTC;HORT) PLANT TISSUE CULTURE AND BIOTECHNOLOGY (3) Principles and techniques for the in vitro culture, propagation, and genetic manipulations of plant cells. Prerequisite: BIOL 230W; or B M B 251, B M B 252

BIOL 460 (ANTH) HUMAN GENETICS (3) Gene mapping in humans; molecular basis of genetic disease; genomic structure; immunogenetics; and genetic evidence for human evolutionary history. Prerequisite: BIOL 230W or 3 credits in genetics

BIOL 460H (ANTH) HUMAN GENETICS (4) Gene mapping in humans; molecular basis of genetic disease; gnomic structure; immunogenetics; and genetic evidence for human evolutionary history. Prerequisite: 3 credits in genetics, or ANTH 021, or BIOL 222, or BIOL 230W; and 3 credits in statistics

BIOL 461 CONTEMPORARY ISSUES IN SCIENCE AND MEDICINE (3 credits per semester) Current/classical issues relating to health, research, agriculture, environment, and biotechnology. Active exploration of the impact of science on society. Prerequisite: A 400-level Biology course.

BIOL 463 GENERAL ECOLOGY (3) Illustrates science of ecology, from individual, population, and community-level perspectives, discusses applications of this science to issues of conservation of biodiversity. Prerequisite: BIOL 220

BIOL 464 (ANTH) SOCIOBIOLOGY (3) The study of the adaptive function of social behavior, the comparative analysis of social organization, and the ecology of sociality. Prerequisite: 6 credits in biology or anthropology

BIOL 465 GENERAL CYTOLOGY (3) Structure and function of organelles of plant and animal cells, mitosis, meiosis, cytological techniques. Prerequisite: 12 credits in biology and/or molecular and cell biology

BIOL 466 LABORATORY IN CYTOLOGY (1) Laboratory exercises concerning aspects of cell structure and function and cytological equipment and techniques discussed in BIOL 465. Prerequisite: or concurrent: BIOL 465

BIOL 469 (BB H) NEUROBIOLOGY (3) Comprehensive examination of neuroanatomy and physiology designed to integrate the principles of neurochemistry, neuroendocrinology, and molecular biology. Prerequisite: BIOL 240W

BIOL 470 (BB H) FUNCTIONAL AND INTEGRATIVE NEUROSCIENCES (3) Neurobiological function in motivated behaviors, motor and sensory functions, learning and memory development, sexual differentiation, and pathology. Prerequisite: BIOL 469

BIOL 471 MOLECULAR NEUROBIOLOGY/CELL BIOLOGY LABORATORY (3) Introduction to modern molecular and cellular methodologies. The course is designed to integrate the principles of molecular cell biology with neurochemistry and neuroendocrinology. Prerequisite: BIOL 469

BIOL 472 MAMMALIAN PHYSIOLOGY (3) Mechanisms concerned with normal animal function, with special emphasis on humans. Prerequisite: BIOL 240W, CHEM 035

BIOL 473 LABORATORY IN MAMMALIAN PHYSIOLOGY (2) Laboratory experiments demonstrating fundamentals in physiology. Prerequisite: or concurrent: BIOL 472

BIOL 474 (GEOSC) ASTROBIOLOGY (3) In depth treatment of principles/concepts of biochemical evolution, the origin/evolution of life; evaluation of distribution of life in the universe. Prerequisite: BIOL 110, CHEM 012

BIOL 477 BIOLOGY OF HUMAN SEXUALITY (3) Biological aspects of human sexual development, response, expression, function, and dysfunction among individuals of various ages and life experiences. Prerequisite: BIOL 341

BIOL 479 GENERAL ENDOCRINOLOGY (3) Endocrine mechanisms regulating the morphogenesis, homeostasis, and functional integration of animals. Prerequisite: BIOL 141 or BIOL 472

BIOL 482 COASTAL BIOLOGY (4) Marine organisms, their interactions with each other, and their relationships with several coastal habitats. Prerequisite: BIOL 220W

BIOL 496 INDEPENDENT STUDIES (1–18)
BIOL 497 SPECIAL TOPICS (1–9)
BIOL 498 (ENT) SPECIAL TOPICS (1–9)
BIOL 499 (GI) FOREIGN STUDIES (1–12)
BIOL 499A TROPICAL FIELD ECOLOGY (3) An intensive introduction to tropical biodiversity to be taught in Belize, Central America. Prerequisite: BIOL 220W
*Students must take a combination of BIOL 011 GN and 012 GN to receive General Education credit in biology.
+BIOL 220W GN, 230 GN, and 240W GN each carry only 1 credit to "Writing"; all three courses must be taken to meet the W requirement.

BIOMEDICAL ENGINEERING TECHNOLOGY (BE T)

College of Engineering
BE T 197, 297, 298 SPECIAL TOPICS (1–9)
BE T 201 PHYSIOLOGICAL TRANSDUCERS (5) Study of the principles of operation and applications of devices used for the conversion of physiological events to electrical signals. Prerequisite: EE T 114, MATH 082
BE T 202 BIOMEDICAL INSTRUMENTATION AND SYSTEMS (4) Introduction to the operating principles, maintenance and analytic troubleshooting of electronic, fluid and pneumatic biomedical equipment. Prerequisite: BE T 201, BE T 205
BE T 203 BIOMEDICAL EQUIPMENT LABORATORY (INTERNSHIP) (4) Practical experience, within or related to the hospital environment, on a variety of biomedical instruments. Prerequisite: BE T 204, BIOL 141
BE T 204W MEDICAL AND CLINICAL EQUIPMENT (4) Principles of operation of clinical, intensive care, anesthesia, respiratory, imaging, and emergency equipment; hospital electrical safety; report writing and presentations. Prerequisite: BE T 201, BE T 205, BIOL 141
BE T 205 HIGH POWER MEDICAL EQUIPMENT (3) A study of high-power medical instrumentation using lumped-element p-n junction devices, crystals, and lasers. Prerequisite: EE T 114
BE T 296 INDEPENDENT STUDIES (1–18)

BIOTECHNOLOGY (BIOTC)

Eberly College of Science
BIOTC 416 (MICRB) MICROBIAL BIOTECHNOLOGY (2) Fundamentals of applied biotechnology; the use of microorganisms in the synthesis of biologically-important and industrially-useful products. Prerequisite: MICRB 201, MICRB 202; B M B 342 or MICRB 342
BIOTC 459 (BIOL;HORT) PLANT TISSUE CULTURE AND BIOTECHNOLOGY (3) Principles and techniques for the in vitro culture, propagation, and genetic manipulations of plant cells. Prerequisite: BIOL 230W; or B M B 251, B M B 252
BIOTC 460 (AGRO) MOLECULAR GENETICS OF TRANSGENIC PLANTS (3) Understanding the biology and inheritance of genetic traits through the use of genetically modified plants, progress on developments of transgenic crops, their advantages, problems and regulatory issues. Prerequisite: BIOL 230W, B M B 251, or equivalent
BIOTC 479 METHODS IN BIOFERMENTATIONS (3) Bioprocessing principles and development; uses and operation of biofermentors; determination of biomass; problems of scale-up. Prerequisite: MICRB 201, MICRB 202; B M B 251, B M B 252, B M B 342
BIOTC 489 (V SC) ANIMAL CELL CULTURE METHODS (3) An overview of animal cell culture methodology and its practical application in bioprocess technology. Prerequisite: MICRB 201, MICRB 202; BIOL 230W or B M B 251

BRASS, MUSIC (BRASS)

College of Arts and Architecture
See **www.psu.edu/bulletins/bluebook**, University Course Descriptions button.

BUSINESS (BUS)

Capital College
BUS 305 FOUNDATIONS OF BUSINESS (3) Comprehensive review of all important facets of business enterprise. Prerequisite: may be taken for credit only by non-business or general business majors
BUS 330 INSURANCE I (3) Insurance principles and coverages available for protection of property and liability losses, fidelity and surety bonding.
BUS 331 INSURANCE II (3) Introduction to principles and methods of handling business and personal risks with emphasis on life, health, and social insurance techniques.
BUS 335 REAL ESTATE FUNDAMENTALS (3) Examination of real estate and market forces affecting it; finance, sales, and brokerage operations.
BUS 336 REAL ESTATE PRACTICE (3) Examination of real estate practice; listing agreements; appraisal; financing; property management and insurance; investment; fair housing laws and ethical practices. Prerequisite: BUS 335

BUS 340 BUSINESS LAW (3) Course examines topics such as commercial paper, secured transactions, bankruptcy, suretyship, professionals' libility, malpractice, and related topics.
BUS 341 LEGAL ENVIRONMENT OF BUSINESS (3) The general legal process and its application in the areas of antitrust, employment, labor, environmental, and product liability law. Prerequisite: BUS 340
BUS 360 ELEMENTS OF MANAGEMENT SCIENCE (3) Decision making under uncertainty, linear programming, waiting line models, game theory, and simulation. Prerequisite: MATH 110; MS&IS 200 or STAT 200
BUS 361 OPERATIONS MANAGEMENT (3) Methods for analyzing alternatives aimed at optimizing scarce resources. Emphases in standards, measures, processes, and systems. Prerequisite: MATH 110; MS&IS 200 or STAT 200
BUS 364W (GI) BUSINESS AND SOCIETY (3) Business organizations and the sociocultural environment; current issues; corporate responsibility; international and multinational business environments. Prerequisite: ENGL 202D, MNGMT 310
BUS 395 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
BUS 397, 497 SPECIAL TOPICS (1–9)
BUS 430 INSURANCE AND ESTATE PLANNING (3) Guides to the organization and distribution of an estate by its owner. Prerequisite: ACCTG 211, BUS 340
BUS 432 RISK MANAGEMENT (3) In-depth study of risk as it relates to property and liability losses affecting individuals and businesses. Prerequisite: BUS 330, BUS 331
BUS 454H BUSINESS HONORS THESIS/PROJECT (3) An opportunity to pursue an advanced research thesis or project to integrate studies within Business Administration. Prerequisite: HONOR 301, senior standing, and permission of the program
BUS 462 BUSINESS STRATEGY (3) Interpretation of business concept in the analysis of problems related to the successful management of a company, institution, or organization. Prerequisite: FINAN 320, MNGMT 310, MRKT 370, and at least senior status
BUS 485 AMERICAN BUSINESS OVERSEAS (3) Within the fundamentals of international businss, special attention will be given to the impact of American business activities overseas.
BUS 491 MANAGERIAL STATISTICS (3) An accelerated course applying statistical techniques to management and economic problems. Prerequisite: admission to Master of Administration program
BUS 492 MANAGEMENT SCIENCE (3) An exposure to calculus and to standard deterministic and probabilistic operations research models. Prerequisite: BUS 491, admission to M.B.A. program
BUS 494 RESEARCH PROJECT (1–12)
BUS 495 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
BUS 496 INDEPENDENT STUDIES (1–18)

BUSINESS ADMINISTRATION (B A)

Smeal College of Business

B A 100 INTRODUCTION TO BUSINESS (3) A comprehensive view of the contemporary environment of business.
B A 100W INTRODUCTION TO BUSINESS (3) A comprehensive view of the contemporary environment of business.
B A 195 COOPERATIVE PRACTICUM WITH BUSINESS OFFICES (3–6) Cooperative practical work with business offices under the supervision of the instructor.
B A 197, 297, 497 SPECIAL TOPICS (1–9)
B A 198, 298 SPECIAL TOPICS (1–9)
B A 199 FOREIGN STUDIES (1–12)
B A 241 LEGAL ENVIRONMENT OF BUSINESS (2) Examines the legal system's role and impact regarding business transactions, liability issues, and ownership of intellectual property. Students earning credit for B A 241 may not earn credit toward Smeal College baccalaureate degree for B Law 243 and/or B A 243.
B A 242 SOCIAL AND ETHICAL ENVIRONMENT OF BUSINESS (2) Explores the social and ethical environment of business and ethical decision making in a business context.
B A 243 SOCIAL, LEGAL, AND ETHICAL ENVIRONMENT OF BUSINESS (4) Explores the ethical, political, social, legal and regulatory, technological, and demographic diversity environment of business. A student may not receive credit toward graduation for both B LAW 243 and B A 243.
B A 250 PROBLEMS OF SMALL BUSINESS (3) Analysis of problems of the small firm, particularly for the student who wishes to venture into business. Prerequisite: 3 credits in economics
B A 296, 496 INDEPENDENT STUDIES (1–18)
B A 299 FOREIGN STUDIES (1–12 per semester)
B A 301 FINANCE (2) This course provides an overview of finance. The primary focus is on financial decision making in organizations–also known as corporate finance. In addition to corporate finance, the course also covers the two other primary areas of finance: financial markets and institutions, and investments. Prerequisite: ACCTG 211, ECON 002, ECON 004; M I S 204 or IST 110; MS&IS 200 or STAT 200

B A 302 SUPPLY CHAINS (2) Introduction to key elements and strategic importance of supply chain networks. Prerequisite: ACCTG 211, B A 241, B A 242, ECON 002, ECON 004, M I S 204, MS&IS 200
B A 303 MARKETING (2) Introduction to customer behavior and research, service/product development, pricing and promotion in diverse and international marketing contexts. Prerequisite: ACCTG 211, ECON 002, ECON 004; M I S 204 or IST 110; MS&IS 200 or STAT 200; B A 241 and B A 242 or B A 243
B A 304 MANAGEMENT AND ORGANIZATION (2) Introduction to key concepts for the design and management of organizations. Prerequisite: ACCTG 211, ECON 002, ECON 004; M I S 204 or IST 110; MS&IS 200 or STAT 200
B A 321 CONTEMPORARY SKILLS FOR BUSINESS PROFESSIONALS (1–3) Technological and interpersonal skills for the contemporary business professional, stressing collaborative learning, electronic inquiry and communications, critical thinking, and problem solving. Prerequisite: ACCTG 211; ECON 002 or ECON 004; M I S 103 or CMPSC 203; MS&IS 200 or STAT 200; SPCOM 100; Prerequisite or concurrent: ENGL 202D.
B A 322 INDIVIDUAL AND INTERPERSONAL EFFECTIVENESS FOR THE BUSINESS PROFESSIONAL (1–3) Effectiveness of the business professional in team settings, especially the capacity to execute both technologically and cooperatively through group exercises. Prerequisite: B A 321
B A 323 REGIONAL ECONOMIES OF PENNSYLVANIA (3) Study of the people, the policies, and the organizations that form the local and regional business environment of Pennsylvania. Prerequisite: fifth-semester standing
B A 395A PRACTICUM IN BUSINESS ADMINISTRATION (1) Professional and guided work experience in business administration with private or public organizations. May be taken only as an elective. Prerequisite: FIFTH-SEMESTER STANDING
B A 399 FOREIGN STUDIES (1–12)
B A 411 ANALYZING BUSINESS AND INDUSTRY (3) Prepares students to read, interpret, and analyze financial statements effectively in order to evaluate business entities and their industries. Prerequisite: ACCTG 211, B A 301, B A 302, B A 303, B A 304
B A 412H HONORS INTEGRATION AND RESEARCH (2–3 per semester) The integration of the business core into a detailed financial, strategy and market analysis of actual companies selected by student teams. Prerequisite: B A 301, B A 302, B A 303, B A 304, or any two of these with the other two taken concurrently.
B A 420 PLANNING FOR INTERNSHIP, COLLABORATIVE PROJECT, AND RESEARCH IN BUSINESS (1) Planning, preparation, and decision making for students enrolling in either B A 495A, 495B, or 495C courses in their final semester. Prerequisite: B A 321 and sixth-semester standing
B A 421 PROJECT MANAGEMENT AND PLANNING FOR BUSINESS (1–2) Planning and preparation for field experience internship, senior thesis, or group project supplemented with exercises in project management. Prerequisite: B A 322
B A 422W CONTEMPORARY BUSINESS SEMINAR (3) Presentations and discussion of contemporary business issues by students and visiting professionals; emphasis on effective business communications. Prerequisite: B A 421 Concurrent: B A 495A, B A 495B, or B A 495C
B A 494 RESEARCH PROJECT COURSES (1–12)
B A 495A INTERNSHIP IN BUSINESS (3–9) Guided professional practicum in business administration involving an internship with a business organization; practice of business skills in field setting. Prerequisite: B A 322, B A 420
B A 495B COLLABORATIVE PROJECT IN BUSINESS (3–9) Guided professional practicum in business administration involving a group project; application of business skills in collaborative setting. Prerequisite: B A 322, B A 420
B A 495C UNDERGRADUATE RESEARCH IN BUSINESS (3–9) Guided student research in business administration; application of analytical or research techniques to business problems. Prerequisite: B A 322, B A 420
B A 499 (GI) FOREIGN STUDY—BUSINESS ADMINISTRATION (1–18) Study in selected countries of business institutions, functions, and current business problems. Prerequisite: ACCTG 211; ECON 002, ECON 004; MS&IS 200

BUSINESS ECONOMICS (BECON)

Penn State Erie, The Behrend College

BECON 294, 494 RESEARCH PROJECT (1–12)
BECON 296, 496 INDEPENDENT STUDIES (1–18)
BECON 297, 497 SPECIAL TOPICS (1–9)
BECON 495 INTERNSHIP (1–18)

BUSINESS LAW (B LAW)

Smeal College of Business

B LAW 243 LEGAL ENVIRONMENT OF BUSINESS (3) Social control through law: courts, basic policies underlying individual and contractual rights in everyday society. May not be used to satisfy Smeal College baccalaureate degree requirements. Not available to students who have taken B A 243. Prerequisite: third-semester standing
B LAW 296, 496 INDEPENDENT STUDIES (1–18)
B LAW 297, 298; 497, 498 SPECIAL TOPICS (1–9)

B LAW 325 (R EST) REAL ESTATE LAW (3) Analyze contemporary law applicable to various types of ownership interests and rights, methods of transferring ownership, and use of real property. Prerequisite: B A 243 or B LAW 243 or R EST 301
B LAW 344 COMMERCIAL TRANSACTIONS (3) Bailments, shipments, and sales of goods; financing transactions and creditors' rights; commercial paper. Prerequisite: B A 243 or B LAW 243
B LAW 346 LAW OF BUSINESS ORGANIZATIONS (3) Introduction to the principles of agency, partnership, and corporation law. Prerequisite: B A 243 OR B LAW 243
B LAW 397, 398 SPECIAL TOPICS (1–9)
B LAW 410 CRIMINAL LAW IN THE BUSINESS COMMUNITY (3) The basic principles of criminal law as they affect society and the business community. Prerequisite: B A 243 or B LAW 243
B LAW 425 (R EST) ENVIRONMENTAL LAW, PROPERTY, AND COMMERCE (3) Examines the impacts of major federal environmental laws on business relations and property interests. Prerequisite: B A 243, B LAW 243, or E R M 151
B LAW 445 BUSINESS AND PUBLIC LAW (3) Rights and responsibilities of business under the American constitutional system; illegal combinations and restraints of trade. Prerequisite: B A 243 or B LAW 243
B LAW 471 (ADM J) LEGAL RIGHTS, DUTIES, LIABILITIES OF CRIMINAL JUSTICE PERSONNEL (3) Civil law issues within a justice agency and between criminal justice agencies and members of the public. Prerequisite: ADM J 111 or B LAW 243
B LAW 473 (ADM J) CRIMINAL PROCEDURE AND EVIDENCE IN THE BUSINESS COMMUNITY (3) Law of evidence and proof, constitutional constraints on police procedures (arrest, search, etc.) in society and the business community. Prerequisite: ADM J 111 or B A 243

BUSINESS LOGISTICS (B LOG)

Smeal College of Business
B LOG 296 INDEPENDENT STUDIES (1–18)
B LOG 297, 298 SPECIAL TOPICS (1–9)
B LOG 301 BUSINESS LOGISTICS MANAGEMENT (3) Management of logistics/supply chain processes. Prerequisite: 3 credits each in mathematics and English; CMPSC 203 or equivalent; not available to baccalaureate business students in Smeal College
B LOG 305 SUPPLY CHAIN MANAGEMENT (3) Management of synchronized flows of goods, information, and cash over integrated logistics networks. Prerequisite: or concurrent: B A 303
B LOG 320 TRANSPORT SYSTEMS (3) Strategic role of freight transportation systems and services in supply chain networks. Prerequisite: B LOG 301 or B LOG 305
B LOG 395 PRACTICUM IN BUSINESS LOGISTICS (1–3) Professional and guided work experience in transportation and/or logistics with private or public organizations. Prerequisite: 6 credits in business logistics
B LOG 397 SPECIAL TOPICS (1–9)
B LOG 398 SPECIAL TOPICS (1–9)
B LOG 400 TRANSPORT PLANNING ANALYSIS (3) Application of model building, simulation, and other techniques for economic and quantitative analysis to the solution of problems involving transportation. Prerequisite: 3 credits in economics, 3 credits in statistics
B LOG 405 WAREHOUSING AND TERMINAL MANAGEMENT (3) Administration of warehouse and terminal functions in logistics systems, with analysis of customer service, forecasting, inventory, investment, design, and operation. Prerequisite: B LOG 301 or B LOG 305
B LOG 410 TRANSPORT ECONOMICS AND POLICY (3) Advanced study of the principles of transportation economics and their application and the impacts of transport policy choices. Prerequisite: B LOG 320
B LOG 415 STRATEGIC PROCUREMENT (3) Development of procurement and supply management strategies to support synchronized supply chains. Prerequisite: B LOG 301 or B LOG 305; B LOG 320
B LOG 420 URBAN TRANSPORTATION (3) Development of urban transportation; relationship to urban development; role of government and solutions to urban transportation problems. Prerequisite: 3 credits in economics; 3 credits in geography, sociology, or political science
B LOG 421 LOGISTICS ANALYSIS (3) Design, develop, and use computer decision models for analysis of logistics problems; computer intensive coursework emphasizing spreadsheet applications. Prerequisite: B LOG 301 or B LOG 305; CMPSC 203. Prerequisite or concurrent: B LOG 320; enrollment in The Smeal College or three credits of statistics, computer science, and mathematics
B LOG 425W LOGISTICS AND SUPPLY CHAIN LEADERSHIP (3) Issues and practices with respect to technology adoption, change management, financial/capability assessment, and relationship management in supply chain networks. Prerequisite: B LOG 305, B LOG 320, and B LOG 421
B LOG 430 TRANSPORT PROBLEMS (3) Selected problems in transport systems and transport management. Prerequisite: B LOG 301 or B LOG 305; B LOG 320
B LOG 432 LOGISTICS SYSTEMS IN SERVICE INDUSTRIES (3) Theory and application of supply chain logistics in service business emphasizing service response systems for coordination of non-material activities. Prerequisite: B A 302, B A 303
B LOG 455 INTERNATIONAL LOGISTICS (3) Design and operation of global supply chain networks. Prerequisite: B LOG 301 or B LOG 305; B LOG 320
B LOG 496 INDEPENDENT STUDIES (1–18)
B LOG 497, 498 SPECIAL TOPICS (1–9)

CERAMIC SCIENCE AND ENGINEERING (CERSE)

College of Earth and Mineral Sciences

CERSE 401 CERAMIC REACTIONS AT HIGH TEMPERATURES (3) Fundamental approach to predicting and explaining chemical reactions of ceramics at high temperature. Prerequisite: CHEM 013, CHEM 015, E MCH 210, MATH 231, MATH 251, PHYS 214

CERSE 411 SOLID STATE REACTIONS IN CERAMICS (3) Structural imperfections, diffusion; reactions in ceramic systems; nucleation and crystallization; sintering, grain growth, and Ostwald ripening. Prerequisite: MATSE 410, MATSE 412, MATSE 414

CERSE 497 SPECIAL TOPICS (1–9)

NOTE: Courses in the use of X-ray diffraction, electron microscopy, and spectroscopy in ceramic studies are listed under GEOSCIENCES and MATERIALS SCIENCE.

CHEMICAL ENGINEERING (CH E)

College of Engineering

CH E 012 CHEMICAL ENGINEERING LECTURE (1) Lectures and discussion by visiting engineers and faculty on chemical engineering, job selection, patents, licensing, ethics, and other professional problems. Prerequisite: sixth-semester standing

CH E 097 SPECIAL TOPICS (1–9)

CH E 294 RESEARCH PROJECT (1–12)

CH E 296 INDEPENDENT STUDIES (1–18)

CH E 297 SPECIAL TOPICS (1–9)

CH E 301 PRINCIPLES OF CHEMICAL ENGINEERING I (3) An integrated approach to the study of material balances and industrial chemical processes important in chemical engineering. Prerequisite: or concurrent: CHEM 038, MATH 251

CH E 302A PROCESS FLUID MECHANICS (3) An integrated study of the fundamentals and the quantitative design techniques involving flow of fluids in chemical processes. Prerequisite: CH E 301, MATH 230 or MATH 231. Prerequisite or concurrent: CH E 303

CH E 302B PROCESS HEAT TRANFER (2) An integrated study of the fundamentals and the quantitative design techniques involving heat transfer in chemical processes. Prerequisite: CH E 301, MATH 230 or MATH 231. Prerequisite or concurrent: CH E 302A, CH E 303

CH E 303 PRINCIPLES OF CHEMICAL ENGINEERING III (3) Chemical process applications of energy balances, equations of state, thermodynamic properties of real fluids, second law of thermodynamics, cycles. Prerequisite: MATH 231. Prerequisite or concurrent: CH E 301

CH E 304 PHASE AND CHEMICAL EQUILIBRIA (2) Pure component phase properties, solution properties, physical equilibria among phases, chemical reaction equilibria. Prerequisite: CH E 301, CH E 303

CH E 401 CHEMICAL PROCESS ENGINEERING (3) Profitability, economic choice, and optimization of chemical processes. Prerequisite: CH E 302A, CH E 302B, CH E 413. Prerequisite or concurrent: CH E 414

CH E 407W CHEMICAL ENGINEERING LABORATORY (3) Data interpretation and correlation from student-operated experiments on pilot-plant equipment. Individual written and oral technical reports. Prerequisite: CH E 302A, CH E 302B, CH E 413, CH E 414, ENGL 202C

CH E 409 BIOTECHNOLOGY LABORATORY (3) Techniques in bioprocessing including strain development and selection, fermentation operations, scale-up plus biochemical separation and purification. Prerequisite: B M B 251, CH E 414, CH E 438, MICRO 201

CH E 413 MASS TRANSFER OPERATIONS (3) Applications of phase equilibria and mass transfer for stagewise and continuous contact operations such as distillation, absorption, and extraction. Prerequisite: or concurrent: CH E 304

CH E 414 KINETICS AND INDUSTRIAL CHEMISTRY (3) Chemical reaction rates and equilibria, reactors, reactor design; emphasis on industrial chemical processes. Prerequisite: CH E 302A, CH E 302B, CH E 304

CH E 415 MATHEMATICAL MODELING IN CHEMICAL ENGINEERING (3) Mathematical model formulation of chemical and physical processes, including applications of ordinary and partial differential equations; numerical methods; statistical techniques. Prerequisite: CH E 302A, CH E 302B, CH E 414, MATH 220; MATH 251; CMPSC 201C, CMPSC 201F, or working knowledge of a structured programming language

CH E 420 CRYOGENIC ENGINEERING (3) Production, properties, and use of liquefied gases; design of apparatus for use at very low temperatures. Prerequisite: CH E 304 or M E 022

CH E 432 (F SC) PETROLEUM PROCESSING (3) A study of physical and chemical processes to convert crude oil into desired products with an outlook from present to future. Prerequisite: CHEM 038

CH E 435 (F SC) INDUSTRIAL ORGANIC CHEMISTRY (3) Chemistry and processes for producing organic chemicals and materials in existing and emerging new manufacturing sectors of organic chemical industry. Prerequisite: CHEM 038

CH E 438 BIOPROCESS ENGINEERING (3) Introduction to the biotechnology field including consideration of upstream and downstream processing of biochemicals. Prerequisite: CHEM 039

CH E 441 POLYMER PROCESSING (3) Application of principles of heat, mass, and momentum transfer to the analysis of polymer processing problems. Prerequisite: CH E 302A, CH E 302B or PLMSC 406

CH E 446 INTRODUCTION TO TRANSPORT PHENOMENA (3) Fundamental treatment of mass, heat, and momentum transfer; emphasis on transport properties and mathematical models of chemical engineering trans-

port processes. Prerequisite: CH E 302A, CH E 302B, MATH 220, MATH 231, MATH 251; CMPSC 201C or CMPSC 201F or working knowledge of a structured programming language
CH E 448 ADVANCED MASS TRANSFER OPERATIONS (3) Diffusion and mass transfer as applied to stagewise and continuous contact operations, including equipment design. Prerequisite: CH E 413
CH E 450 PROCESS DYNAMICS AND CONTROL (3) Analysis of time-dependent variables in chemical process plants; reactor design and control; computer applications. Prerequisite: CH E 413. Prerequisite or concurrent: CH E 414
CH E 453 THERMODYNAMICS FOR CHEMICAL ENGINEERS (3) Physical and chemical equilibria in multicomponent systems, including chemically reacting and heterogeneous systems. Prerequisite: CH E 304
CH E 455 CHEMICAL REACTOR DESIGN (3) Application of kinetics to reactor design: nonideal and nonisothermal reactors; scale-up techniques; adsorption and heterogeneous catalysis. Prerequisite: CH E 414
CH E 464 DESIGN OF CHEMICAL PLANTS (3) Lectures and practicum on methods and calculations, including economic evaluations for the design of chemical plants; formal technical report required. Prerequisite: CH E 401
CH E 465 DESIGN PROJECTS IN CHEMICAL ENGINEERING (1–6) Problems in design and/or synthesis of chemical engineering processes and/or systems, including a final report on project results. Prerequisite: CH E 401
CH E 465 DESIGN PROJECTS IN CHEMICAL ENGINEERING (1–6) Problems in design and/or synthesis of chemical engineering processes and/or systems, including a final report on project results. Prerequisite: CH E 401
CH E 494 RESEARCH PROJECTS IN CHEMICAL ENGINEERING (1–6) An original problem, including a search of the literature, experimental investigation, and preparation in formal thesis form. Prerequisite: CH E 302, CH E 413. Prerequisite or concurrent: CH E 414
CH E 496 INDEPENDENT STUDIES (1–18)
CH E 497 SPECIAL TOPICS (1–9)

CHEMISTRY (CHEM)

Eberly College of Science

CHEM 001 (GN) MOLECULAR SCIENCE (3) Selected concepts and topics in chemistry and related physical sciences showing their development, interrelationship, and present status. Students who have received credit for CHEM 002, 011, or 012 may not schedule this course.
CHEM 002 (GN) MOLECULAR SCIENCE (3) Selected concepts and topics in chemistry and related physical sciences showing their development, interrelationship, and present status. Students who have received credit for CHEM 001, 011, or 012 may not schedule this course.
CHEM 006 PROBLEM SOLVING IN CHEMISTRY (1) Techniques, strategies, and skills for solving problems in general chemistry. Prerequisite: required by FTCAP Concurrent: CHEM 012
CHEM 011 INTRODUCTORY CHEMISTRY (3) Selected principles and applications of chemistry. Prior study of chemistry not assumed. Prerequisite: MATH 021; or satisfactory performance on the MATH FTCAP examination— i.e., placement beyond the level of MATH 021
CHEM 011L INTRODUCTORY CHEMISTRY (3) Selected principles and applications of chemistry. Prior study of chemistry not assumed.
CHEM 011P INTRODUCTORY CHEMISTRY (3) Selected principles and applications of chemistry. Prior study of chemistry not assumed.
*CHEM 012 (GN) CHEMICAL PRINCIPLES (3) Basic concepts and quantitative relations. The following combinations of courses must be taken to receive General Education credit in chemistry: CHEM 012 GN (or CHEM 017 GN) and CHEM 014 GN; CHEM 013 GN and CHEM 015 GN. Prerequisite: satisfactory performance on the Chemistry and Math FTCAP tests— i.e., placement beyond the level of CHEM 011 and MATH 022; or CHEM 011, and MATH 022 or MATH 041
*CHEM 013 (GN) CHEMICAL PRINCIPLES (3) Continuation of CHEM 012, including an introduction to the chemistry of the elements. The following combinations of courses must be taken to receive General Education credit in chemistry: CHEM 012 GN (or CHEM 017 GN) and CHEM 014 GN; CHEM 013 GN and CHEM 015 GN. Prerequisite: CHEM 012 or CHEM 017. Prerequisite or concurrent: CHEM 014
*CHEM 014 (GN) EXPERIMENTAL CHEMISTRY (1) Introduction to quantitative experimentation in chemistry. The following combinations of courses must be taken to receive General Education credit in chemistry: CHEM 012 GN (or CHEM 017 GN) and CHEM 014 GN; CHEM 013 GN and CHEM 015 GN. Prerequisite: or concurrent: CHEM 012 OR CHEM 017
*CHEM 015 (GN) EXPERIMENTAL CHEMISTRY (1) Continuation of CHEM 014, with emphasis on analytical procedures. The following combinations of courses must be taken to receive General Education credit in chemistry: CHEM 012 GN (or CHEM 017 GN) and CHEM 014 GN; CHEM 013 GN and CHEM 015 GN. Prerequisite: CHEM 014. Prerequisite or concurrent: CHEM 013
CHEM 015B EXPERIMENTAL CHEMISTRY—BIOSCIENCE (1) A continuation of CHEM 014 with emphasis on bioscience examples of analytical procedures. Prerequisite: CHEM 014. PREREQUISITE OR CONCURRENT: CHEM 013
CHEM 016 THE PROFESSIONAL CHEMIST (1) Industrial employment opportunities and challenges; graduate and professional school opportunities; tailoring the chemistry curriculum to career goals. Prerequisite: fifth-semester standing in chemistry

CHEM 017 (GN) INTRODUCTORY AND GENERAL CHEMISTRY (5) Introductory chemistry and chemical principles for students who are required to take additional chemistry, e.g., CHEM 013, but are unprepared for CHEM 012 Lab. Prerequisite: satisfactory performance on the Math FTCAP test—i.e., placement beyond the level of MATH 022; or MATH 022 or MATH 041

CHEM 017L (GN) INTRODUCTORY AND GENERAL CHEMISTRY (5) Introductory chemistry and chemical principles for students who are required to take additional chemistry, e.g., CHEM 013, but are unprepared for CHEM 012 Lab.

CHEM 017P (GN) INTRODUCTORY AND GENERAL CHEMISTRY (5) Introductory chemistry and chemical principles for students who are required to take additional chemistry, e.g., CHEM 013, but are unprepared for CHEM 012 Lab.

CHEM 017R (GN) INTRODUCTORY AND GENERAL CHEMISTRY (5) Introductory chemistry and chemical principles for students who are required to take additional chemistry, e.g., CHEM 013, but are unprepared for CHEM 012 Lab.

CHEM 034 ORGANIC CHEMISTRY (3) Introduction to organic chemistry, with emphasis on the properties of organic compounds of biochemical importance. Not open to those who have previously scheduled CHEM 037. Prerequisite: CHEM 011, CHEM 012, or CHEM 017

CHEM 035 ORGANIC CHEMISTRY (3) Introduction to organic chemistry, with emphasis on the identification of organic compounds by characteristic chemical reactions and by spectroscopy. Prerequisite: CHEM 034

CHEM 036 LABORATORY IN ORGANIC CHEMISTRY (2) Basic laboratory operations; applications of theories and principles. Prerequisite: CHEM 038. Prerequisite or concurrent: CHEM 039

CHEM 036B LABORATORY IN ORGANIC CHEMISTRY—BIOSCIENCE (2) Basic laboratory operations; synthesis and chemical or instrumental analysis of materials of biological significance. Prerequisite: CHEM 038. Prerequisite or concurrent: CHEM 039

CHEM 038 ORGANIC CHEMISTRY (3) Principles and theories; nomenclature; chemistry of the functional groups; applications of spectroscopy. Students may not receive credit for both CHEM 038 and 034. Prerequisite: CHEM 013

CHEM 039 ORGANIC CHEMISTRY (3) Continuation of CHEM 038. Emphasis is placed on the role of organic reactions in biological chemistry. Prerequisite: CHEM 038

CHEM 102 ENVIRONMENTAL CHEMISTRY (3) Applications of chemistry to environmental problems, including air, water, thermal pollution; pesticides; drugs and birth control agents; food additives; etc. For nonchemistry majors; chemistry majors will not receive credit.

CHEM 104 ENVIRONMENTAL CHEMISTRY LABORATORY (1) Introduction of basic laboratory techniques and data analysis used in environmental chemistry. Concurrent: CHEM 102

CHEM 199 (GI) FOREIGN STUDIES (1–12)

CHEM 297 SPECIAL TOPICS (1–9)

CHEM 389 SPECIAL PROBLEMS AND RESEARCH (1–4 per semester, maximum of12) Designed for freshman or sophomore students who are prepared to undertake special problems and research by arrangement with a faculty member.

CHEM 395 CHEMISTRY TEACHER ASSISTANT TRAINING (1–2) Instruction and practice in the role of the teaching assistant in the undergraduate chemistry laboratory.

CHEM 399 (GI) FOREIGN STUDIES (1–12)

CHEM 400 CHEMICAL LITERATURE (1) Instruction in use of the library and of the literature of chemistry. Library problems will be assigned. Prerequisite: 15 credits of chemistry

CHEM 402 CHEMISTRY IN THE ENVIRONMENT (3) Chemistry of the atmosphere, natural waters, and the land surface with particular focus on human influence on processes occurring therein. Prerequisite: CHEM 039

CHEM 405 (NUC E) NUCLEAR AND RADIOCHEMISTRY (3) Theory of radioactive decay processes, nuclear properties and structure, nuclear reactions, interactions of radiation with matter, biological effects of radiation. Prerequisite: PHYS 237, CHEM 452, OR NUC E 301

CHEM 408 COMPUTER APPLICATIONS IN CHEMISTRY (3) Introduction to numerical and nonnumerical computer uses in physical science. Prerequisite: MATH 231. Prerequisite or concurrent: CHEM 451

CHEM 410 INORGANIC CHEMISTRY (3) Conceptual and descriptive aspects of nontransition elements, covering structural, thermodynamic, and kinetic features. Prerequisite: CHEM 013; CHEM 034 OR CHEM 038

CHEM 411 TRANSITION METAL CHEMISTRY (3) Structure and bonding of compounds containing transition metals. Prerequisite: CHEM 013; CHEM 034 OR CHEM 038

CHEM 425 CHROMATOGRAPHY AND ELECTROCHEMISTRY (3) Gas, liquid, and other forms of chromatography; important techniques of electrochemistry. Prerequisite: CHEM 451. Prerequisite or concurrent: CHEM 457

CHEM 426 CHEMICAL SPECTROSCOPY (3) Modern methods and instruments of spectroscopy and their applications to problems of chemical structure and analysis. Prerequisite: CHEM 452, CHEM 457

CHEM 431W ORGANIC AND INORGANIC PREPARATIONS (3) Preparation, purification, and characterization of both organic and inorganic compounds by modern methods. Prerequisite: CHEM 036

CHEM 439 STRUCTURAL ANALYSIS OF ORGANIC COMPOUNDS (3) Spectroscopic methods as tools in gross and detailed structural analysis and interpretation within the framework of modern theory. Prerequisite: CHEM 036

CHEM 448 SURFACE CHEMISTRY (3) Surface chemistry, including a description of modern techniques for characterization and selected heterogeneous catalytic systems. Prerequisite: CHEM 452

+CHEM 451 PHYSICAL CHEMISTRY (3) Introduction to chemical principles, including properties of matter and fundamentals of chemical thermodynamics. (Graduate credit not allowed for students majoring in Biochemistry and Molecular Biology, Chemistry, or Chemical Engineering.) Prerequisite: CHEM 013, MATH 141, PHYS 202 or PHYS 212
+CHEM 452 PHYSICAL CHEMISTRY (3) Continuation of CHEM 451, including molecular structure and chemical kinetics. (Graduate credit not allowed for students majoring in Biochemistry and Molecular Biology, Chemistry, or Chemical Engineering.) Prerequisite: CHEM 451
CHEM 453 THERMODYNAMICS OF CHEMICAL SYSTEMS (3) Chemical thermodynamics, with applications to pure phases, solutions, and chemical reactions; introduction to the methods of statistical thermodynamics. Prerequisite: CHEM 452
CHEM 454 INTRODUCTION TO QUANTUM CHEMISTRY (3) Introduction to theoretical physical chemistry, with emphasis on atomic and molecular structure. Prerequisite: CHEM 452
CHEM 455 PHYSICAL CHEMISTRY OF HIGH POLYMERS (3) Physiochemical principles related to the properties of synthetic and natural polymetric systems. Prerequisite: CHEM 452
+CHEM 457 EXPERIMENTAL PHYSICAL CHEMISTRY (2) Laboratory measurements illustrative of the principles of physical chemistry. (Graduate credit not allowed for students majoring in Biochemistry and Molecular Biology, Chemistry, or Chemical Engineering.) Prerequisite: CHEM 451
+CHEM 458 EXPERIMENTAL PHYSICAL CHEMISTRY (1–2) Laboratory measurements illustrative of the principles of physical chemistry. (Graduate credit not allowed for students majoring in Biochemistry and Molecular Biology, Chemistry, or Chemical Engineering.) Prerequisite: CHEM 452
CHEM 463 CHEMICAL KINETICS (3) Traditional topics in chemical kinetics. Prerequisite: CHEM 452
+CHEM 489 INTRODUCTION TO CHEMICAL RESEARCH (1–10 per semester, maximum of20) Experimental investigation of an original research problem, including a literature search. A formal thesis is optional. (Graduate credit not allowed for students majoring in Chemistry of Chemical Engineering.)
CHEM 496 INDEPENDENT STUDIES (1–18)
CHEM 497 SPECIAL TOPICS (1–9)
CHEM 499 (GI) FOREIGN STUDIES (1–12)
*The following combinations of courses must be taken to receive General Education credit in chemistry: CHEM 012 GN (or 017 GN) and 014 GN; CHEM 013 GN and 015 GN.
+Graduate credit not allowed for student majoring in BioChemistry, Chemistry, or Chemical Engineering.

CHEMISTRY (CHM)

Capital College

CHM 201 FUNDAMENTALS OF CHEMISTRY I (4) Selected principles and applications, with emphasis on quantitative calculations. A basic course not assuming previous study of chemistry.
CHM 202 FUNDAMENTALS OF CHEMISTRY II (3) Selected principles and applications, with emphasis on quantitative calculations. Continuation of CHM 201. Prerequisite: CHM 201
CHM 301 ENVIRONMENTAL CHEMISTRY AND ANALYSIS (3) Chemical principles, interpretation, and methods of analysis for groundwater, water supply, wastewater treatment, stream pollution. Prerequisite: CHEM 013, CHEM 015, CHM 202
CHM 497 SPECIAL TOPICS (1–9)

CHEMISTRY (CHMBD)

Penn State Erie, The Behrend College

CHMBD 097 SPECIAL TOPICS (1–9)
CHMBD 197 SPECIAL TOPICS (1–9)
CHMBD 202 ORGANIC CHEMISTRY FOR TECHNOLOGISTS (3) Fundamentals of organic and polymer chemistry focusing on properties of plastic materials and additives. Intended for engineering technology students. Chemistry majors can not receive credit for this course. Prerequisite: CHEM 012, CHEM 014, PL ET 205
CHMBD 221 QUANTITATIVE ANALYSIS (4) Traditional methods of gravimetric, volumetric, and electrochemical analysis, emphasizing acid-base, solubility, and oxidation-reduction equilibria. Prerequisite: CHEM 013, CHEM 015
CHMBD 296 INDEPENDENT STUDIES (1–18)
CHMBD 297 SPECIAL TOPICS (1–9)
CHMBD 397 SPECIAL TOPICS (1–9)
CHMBD 407 CHEMICAL LITERATURE (1) Introduction to the use of the library and the literature of chemistry in chemical research. Prerequisite: CHEM 039
CHMBD 412 CHEMISTRY OF THE ELEMENTS (4) Theoretical and descriptive chemistry of the inorganic elements. Laboratory synthesis and measurements illustrative of the principles of inorganic chemistry. Prerequisite: CHEM 036
CHMBD 412W CHEMISTRY OF THE ELEMENTS (4) Theoretical and descriptive chemistry of the inorganic elements; laboratory synthesis and measurements illustrative of the principles of inorganic chemistry. Prerequisite: CHEM 036
CHMBD 435 X-RAY CRYSTALLOGRAPHY (3) Theoretical and practical aspects of structure determination using x-ray diffraction, from crystal growth to structure solution. Prerequisite: CHEM 038

CHMBD 441 FUNDAMENTALS OF PHYSICAL CHEMISTRY I (4) A theoretical and experimental study of gases, thermodynamics, chemical equilibrium, and electrochemistry. Prerequisite: CHMBD 221, MATH 141, PHYS 211
CHMBD 442 FUNDAMENTALS OF PHYSICAL CHEMISTRY II (4) A theoretical and experimental study of chemical kinetics, quantum chemistry, and statistical mechanics. Prerequisite: CHMBD 441
CHMBD 443 INSTRUMENTAL ANALYSIS I (4) Sampling techniques, use, interpretation of results from the use of atomic absorption spectroscopy, scanning electron microscope, X-ray and gas analysis, chemiluminescence. Prerequisite: CHMBD 221
CHMBD 444 INSTRUMENTAL ANALYSIS II (4) Use and interpretation of results obtained from spectroscopy, mass spectroscopy, and gas chromatography. Prerequisite: CHEM 036
CHMBD 445 INSTRUMENTAL ANALYSIS (3) General instrumental theory and methods used in common atomic and molecular analyses. Prerequisite: CHMBD 441
CHMBD 446 ELEMENTAL ANALYSIS AND INSTRUMENTAL DESIGN (1) An introduction to the use of modern instruments for problems in chemical structure and analysis. Prerequisite: or concurrent: CHMBD 445
CHMBD 447 ELECTROCHEMISTRY AND CHROMATOGRAPHY (1) An introduction to the use of modern instruments for problems in chemical structure and analysis. Prerequisite: or concurrent: CHMBD 445
CHMBD 448 ATOMIC AND MOLECULAR SPECTROSCOPY (1) An introduction to the use of modern instruments for problems in chemical structure and analysis. Prerequisite: or concurrent: CHMBD 445
CHMBD 449 ORGANIC SPECTRAL ANALYSIS (3) Structure and identification of organic compounds using spectroscopic methods. Prerequisite: CHEM 036
CHMBD 451 GENERAL BIOCHEMISTRY I (3) Basic structure and function of cellular components; principles of enzyme kinetics and regulation. Prerequisite: CHEM 039
CHMBD 452 (BIOBD) GENERAL BIOCHEMISTRY II (3) Principles of bioenergetics, metabolic pathways, biosynthesis of biomolecules, hormonal regulation, and information pathways. Prerequisite: CHMBD 451; or BIOL 230W and CHEM 039
CHMBD 453 (BIOBD) BIOCHEMISTRY LABORATORY (1) An introduction to techniques of experimental biochemistry, illustrating principles covered in CHMBD/BIOBD 452. Concurrent: CHMBD 452
CHMBD 494 CHEMISTRY RESEARCH PROJECT (1–12) Investigation of an original research problem, including a literature search. Preparation of a formal thesis is optional.
CHMBD 495 INTERNSHIP (1–18)
CHMBD 496 INDEPENDENT STUDIES (1–18)
CHMBD 497 SPECIAL TOPICS (1–9)

CHINESE (CHNS)

College of the Liberal Arts

CHNS 001 ELEMENTARY CHINESE I (4) Introductory study of Chinese language, with audio-lingual practice of Mandarin Chinese and attention to structure and the writing system.
CHNS 002 ELEMENTARY CHINESE II (4) Continued audio-lingual practice of Mandarin Chinese, further study of structure, practice in reading and writing Chinese. Prerequisite: CHNS 001
CHNS 003 INTERMEDIATE CHINESE (4) Continued audio-lingual practice of Mandarin Chinese, more extensive practice in reading and writing; study of Chinese culture. Prerequisite: CHNS 002
CHNS 097, 197, 297, 397, 497, 498 SPECIAL TOPICS (1–9)
CHNS 099, 199, 299, 399, 499 (GI) FOREIGN STUDIES (1–12)
CHNS 110 CONVERSATION, READING, AND COMPOSITION (3) Readings in selected modern Chinese literature (short stories, plays, essays, poems) and other texts; practice in conversation and simple composition. Prerequisite: CHNS 003
CHNS 187 CHINESE FRESHMAN SEMINAR (3) The meaning and advantages of a Liberal Arts education in context of a specific discipline. Prerequisite. first-semester standing and enrollment in the College of the Liberal Arts
CHNS 294, 494 RESEARCH PROJECT (1–12)
CHNS 295, 395 INTERNSHIP (1–18)
CHNS 296, 496 INDEPENDENT STUDIES (1–18)
CHNS 401 ADVANCED CONVERSATION (3 per semester, maximum of 6) Emphasis on oral proficiency through discussions of aspects of contemporary Chinese culture. Prerequisite: CHNS 110
CHNS 402 ADVANCED READING (3 per semester, maximum of 6) Readings in representative works of traditional and modern literature; practice in composition; study of aspects of Chinese culture. Prerequisite: CHNS 110

CIVIL ENGINEERING (C E)

College of Engineering

C E 097 SPECIAL TOPICS (1–9)
C E 100S TOPICS AND CONTEMPORARY ISSUES IN CIVIL AND ENVIRONMENTAL ENGINEERING: FIR ST-YEAR SEMINAR (1) First-Year Seminar exploring a specific topic or contemporary issue in civil and environmental engineering.
C E 197 SPECIAL TOPICS (1–9)

C E 209 FUNDAMENTALS OF SURVEYING (2) Fundamental surveying measurements, traverse computations, coordinate geometry, mapping, CAD applications. Intended for architectural engineering students. (The lecture will be taught concurrently with C E 211.) Prerequisite: E G 130 , MATH 141
C E 296 INDEPENDENT STUDIES (1–18)
C E 297 SPECIAL TOPICS (1–9)
C E 300 THE CIVIL ENGINEERING PROFESSION (1) Introduction to the profession of civil engineering and its practice, including social obligations and ethical challenges. Prerequisite: Civil Engineering major
C E 310 SURVEYING (3) Fundamental surveying measurements, traverse computations, coordinate geometry, mapping, GPS and GIS, circular and parabolic curves, earthwork, boundary surveys, CAD applications. Prerequisite: ED&G 100 , MATH 141
C E 321 HIGHWAY ENGINEERING (3) Highway engineering principles, vehicle and driver characteristics; geometric and pavement design; highway drainage; traffic engineering, capacity analysis, and signal timing. Prerequisite: C E 310
C E 332 CONSTRUCTION PROJECT DEVELOPMENT (3) Engineering project evolution to contract award; economic analyses; delivery systems and pricing; contract documents; estimating; professional liability and ethics.
C E 335 ENGINEERING MECHANICS OF SOILS (3) Phase relationships, engineering classification, ground water flow, stresses, shear strength, compaction, and consolidation. Laboratory Prerequisite: E MCH 013; A E 221 or GEOSC 001
C E 336 MATERIALS SCIENCE FOR CIVIL ENGINEERS (4) Introduction to civil engineering materials; their structure and behavior: relationship between structure and behavior. Prerequisite: E MCH 013 , Stat 401
C E 340 STRUCTURAL ANALYSIS (3) Analysis of statically determinate and indeterminate trusses, beams, and frames; reactions, axial forces, shears, moments, deflections. Introduction to influence lines. Prerequisite: E MCH 013. Prerequisite or concurrent: CMPSC 201C or CMPSC 201F
C E 341 DESIGN OF CONCRETE STRUCTURES (3) Design of reinforced concrete beams, slabs, and columns, with emphasis on ultimate-strength methods; prestressed concrete; building and bridge applications. Prerequisite: C E 240. Prerequisite or concurrent: C E 280
C E 341 DESIGN OF CONCRETE STRUCTURES (3) Design of reinforced concrete beams, slabs, and columns, with emphasis on ultimate-strength methods; prestressed concrete; building and bridge applications. Prerequisite: C E 340. Prerequisite or concurrent: C E 336
C E 342 DESIGN OF STEEL STRUCTURES (3) Design of steel tension members, beams, columns, beam-columns, and connections; elastic and plastic methods; design applications. Prerequisite: C E 336 , C E 340
C E 360 FLUID MECHANICS (3) Mechanics of fluids; flow in conduits and around bodies, friction and energy loss, fluid measurements. Prerequisite: E MCH 012
C E 361 ENGINEERING HYDROLOGY (3) Water sources and losses, evaporation, and infiltration effects on streamflows, hydrographs, flood frequency, reservoir uses in flood protection and water conservation. Prerequisite: C E 360
C E 362 HYDRAULIC ENGINEERING (2) Fluid mechanics applied to flow in closed conduits, pumping systems, open channels, culvert hydraulics, and basic principles of groundwater flow. Prerequisite: C E 360
C E 363 FLUID MECHANICS LABORATORY (1) Hydrostatics; the flow of water, air, and oil; calibration of metering devices; pipe friction; elementary hydraulic machinery tests. Prerequisite: C E 360
C E 370 INTRODUCTION TO ENVIRONMENTAL ENGINEERING (3) Nature and scope of environmental issues; air, water, land impacts; fundamentals and processes of pollution control. Prerequisite: CHEM 012; MATH 111 or MATH 141
C E 371 WATER AND WASTEWATER TREATMENT (3) Water treatment; water storage; design of water distribution and wastewater systems; pumping stations. Prerequisite: C E 360 , C E 370
C E 396 INDEPENDENT STUDIES (1–18)
C E 397 SPECIAL TOPICS (1–9)
C E 400 SEMINAR (1–3)
C E 410W SUSTAINABLE RESIDENTIAL SUBDIVISION DESIGN (3) Residential subdivision process; site selection; conservation and neo- traditional design; utility design and layout; best management practices for erosion and stormwater. Prerequisite: A E 372 or C E 332; seventh-semester standing in Architectural or Civil Engineering
C E 421W TRANSPORTATION DESIGN (3) Design of streets and highway facilities; emphasis on geometric elements, intersections and interchanges, roadway drainage, and pavement design. Prerequisite: C E 321
C E 422 TRANSPORTATION PLANNING (3) Transportation systems planning, programming, and management; modeling and simulation, data collection, analysis, and forecasting. Prerequisite: 3 credits in probability or statistics
C E 423 TRAFFIC OPERATIONS (3) The highway capacity manual, concepts and analyses, freeway operations, signalized and unsignalized intersections, signal coordination, traffic impact studies. Prerequisite: C E 321
C E 424 OPTIMIZATION IN CIVIL ENGINEERING SYSTEMS (3) Mathematical modeling; linear programming; dynamic programming; network optimization, including network flows, shortest paths, scheduling; decision-making; civil engineering systems applications. Prerequisite: CMPSC 201C or CMPSC 201F
C E 432 CONSTRUCTION PROJECT CONTROL (3) Fundamentals of project management, construction scheduling using the CPM technique, construction project preplanning, and control of quality, safety, and costs. Prerequisite: C E 332

C E 435 FOUNDATION ENGINEERING (3) Bearing capacity, settlement, and structural design of shallow foundations; lateral earth pressure; retaining and sheet-pile walls; introduction to deep foundations Prerequisite: C E 335. Prerequiste or concurrent: C E 341

C E 436 CONSTRUCTION ENGINEERING MATERIALS (3) Design, production, application, specification, and quality control of construction materials unique to civil engineering. Prerequisite: C E 336 , STAT 401

C E 438W CONSTRUCTION ENGINEERING CAPSTONE DESIGN (3) Construction project integrating geotechnical reports; materials specifications; quality control; equipment; estimation; scheduling; design details: excavations, foundations, retaining walls, formwork, pavements. Prerequisite: C E 332 , C E 432 , C E 435 , C E 436

C E 447 STRUCTURAL ANALYSIS BY MATRIX METHODS (3) Analysis of truss and frame structures using flexibility and stiffness methods of matrix analysis. Computer applications. Prerequisite: C E 340

C E 448W ADVANCED STRUCTURAL DESIGN (3) Wind, snow, seismic, bridge loads; building design using steel, concrete, and prestressed concrete; advanced steel connections; capstone project; computer applications. Prerequisite: C E 341 , C E 342 , C E 435

C E 462 OPEN CHANNEL HYDRAULICS (3) Free surface flow in rivers, canals, steep chutes, stilling basins, and transitions. Prerequisite: C E 360

C E 465W HYDROSYSTEMS CAPSTONE COURSE (3) Hydraulic design of river structures and open channels including supercritical and spatially varied flow; hydrologic/hydraulic computer modeling; design project. Prerequisite: or concurrent: C E 362

C E 471 ENVIRONMENTAL SANITATION (3) Public health engineering applications related to communicable diseases, water supply, wastewater disposal, solid wastes, air pollution, food, vectors, and radiation. Prerequisite: seventh-semester standing, 3 credits in biology, 3 credits in chemistry

C E 472W ENVIRONMENTAL ENGINEERING CAPSTONE DESIGN (3) Principles and design of unit operations for water; domestic and industrial wastewater treatment; equipment selection and application. Prerequisite: C E 370 , C E 371

C E 473 WATER QUALITY MANAGEMENT (3) Water quality criteria and standards; fate and impact of pollutants in aquatic systems; technology available for wastewater renovation. Prerequisite: seventh-semester standing

C E 475 WATER QUALITY CHEMISTRY (3) Chemistry applicable to the understanding and analysis of water quality, pollution, and treatment. Prerequisite: C E 370 , CHEM 012 , CHEM 014

C E 476 SOLID AND HAZARDOUS WASTES (3) Characteristics and treatment of solid wastes and hazardous wastes. Prerequisite: C E 370 , C E 371

C E 479 ENVIRONMENTAL MICROBIOLOGY LABORATORY (1) Introductory microbiology course; application of diagnostic microbiological techniques to the characterization of wastewater enrichment cultures and pure cultures. Prerequisite: MICRB 400 , seventh-semester standing

C E 494 SENIOR THESIS (1–9) Students must have approval of a thesis adviser before scheduling this course.

C E 496 INDEPENDENT STUDIES (1–18)

C E 497 SPECIAL TOPICS (1–9)

CIVIL ENGINEERING (C ENG)

Capital College

C ENG 201 PLANE SURVEYING (3) Theory and practice of common engineering measurements of spatial positions, limited to representation of a plane reference. Prerequisite: trigonmetry, engineering graphics, analytical geometry

C ENG 302 ENGINEERING ECONOMY (3) Principles and methods for analyzing the economic feasibility of technical alternatives leading to a decision or recommendation. Prerequisite: calculus

C ENG 322 STRENGTH OF MATERIALS (3) Axial stress and strain; torsion; stresses in beams; elastic curves and deflections of beams; combined stresses; columns. Prerequisite: calculus, statics

C ENG 361 FLUID MECHANICS (3) Fluid properties; hydrostatics, fluid flow in conduits and open channels; fluid machinery and forces. Prerequisite: statics and dynamics

C ENG 450 LAW AND TECHNOLOGY (3) Introduction to legal aspects of engineering and technology, including intellectual property (patents, copyrights) and products liability.

C ENG 454 SAFETY (3) This course will focus on safety issues as they relate to OSHA. Prerequisite: permission of program

C ENG 455 GEOGRAPHIC INFORMATION SYSTEMS (3) This course will provide a basic understanding of Geographic Information Systems and its engineering-related applications. Prerequisite: seventh-semester engineering or engineering technology student

C ENG 456 PLANNING AND SCHEDULING (3) Theory and practice used in planning and scheduling projects; defining task and resources, creating logic diagrams, and monitoring the projects. Prerequisite: C E T 332 , C E T 435, I ENG 302

C ENG 488D CAPSTONE PROJECT—STRUCTURAL DESIGN (4 credits per semester) This course consists of a structural design project either selected by the students with approval or assigned by the instructor. Prerequisite: eighth-semester Structural Design and Construction Engineering Technology student. Previous or concurrent: C E T 430 , C E T 431 , C E T 432 and C E T 435

CIVIL ENGINEERING TECHNOLOGY (C E T)

Capital College

C E T 201 PLANE SURVEYING (3) Theory and practice related to topographic, construction, and property surveys. Prerequisite: trigonometry, basic engineering graphics, plane geometry

C E T 242 CIVIL ENGINEERING MATERIALS–CONCRETE AND BITUMINOUS (2) Properties and tests for aggregates, portland cement, fresh and hardened concrete, concrete mix designs. Bituminous Materials: properties, mixtures and tests.

C E T 243 CIVIL ENGINEERING MATERIALS—SOILS (2) Soil formation, soil properties, soil classification, soil phase diagrams, soil stresses, soil testing, earth pressures, bearing capacity, slope stability, dewatering. Prerequisite: statics. Prerequisite or concurrent: fluid flow

C E T 301 ENVIRONMENTAL MICROBIOLOGY (2) Introduction to microbiological principles, with emphasis on the examination of water and wastewater, freshwater organisms, and wastewater treatment.

C E T 308 CONSTRUCTION METHODS AND MATERIALS (3) The study of the methods and materials used in the construction industry.

C E T 332 CONSTRUCTION MANAGEMENT I (3) Components of a construction organization, managerial terminology and documents, labor laws and relations, insurance and safety.

C E T 361 FLUID FLOW (3) Fluid flow theory; hydrostatics; dimensional analysis and similitude; pipe flow; flow measurement; open channels; flow forces; fluid machinery. Prerequisite: statics, dynamics

C E T 397 SPECIAL TOPICS (1–9)

C E T 411 WATER POLLUTION ABATEMENT (3) Characteristics of wastewaters, wastewater volumes, oxygen relationships in streams, unit processes for wastewater and sludge treatment, innovative and alternative technologies. Prerequisite: C E T 301, CHM 301

C E T 413 OPERATION AND CONTROL OF TREATMENT SYSTEMS (3) Wastewater treatment, water treatment, solids handling, hazardous waste site control and operation; operator certification. Prerequisite: C E T 415 C E T 411, C E T 424 Concurrent: C E T 416

C E T 415 HYDROLOGY (3) Introduction to hydrology, including watershed response, hydrograph routing, groundwater modeling techniques, erosion, sedimentation, and runoff quality. Prerequisite: C E T 261, MA SC 422

C E T 416 TREATMENT PLANT DESIGN (3) Design of treatment works for water or wastewater based on regulatory requirements and standards. Prerequisite: C E T 411, C E T 415 Concurrent: C E T 417

C E T 417 HYDRAULIC STRUCTURES (3) Design of water and wastewater conveyance systems and storage facilities. Development of water supplies. Prerequisite: C E T 415

C E T 424 SOLID WASTE MANAGEMENT (3) Solid waste collection, salvage and disposal techniques; design optimization including cost analysis, legislation and management. Hazardous waste requirements. Concurrent: C E T 411

C E T 425 HAZARDOUS WASTE CONTROL AND TREATMENT (3) Treatment storage and disposal techniques for toxic and hazardous materials. Prerequisite: C E T 301, C E T 424, CHM 301

C E T 430 STRUCTURAL ANALYSIS (3) Analysis of determinate structures; use of influence lines; deflection of structures; classical methods of analysis of statically indeterminate structures. Prerequisite: strength of materials

C E T 431 STRUCTURAL DESIGN-STEEL (3) Design of steel beams, columns, truss members, decks, bar joists and selected connections. Prerequisite: or concurrent: C E T 430

C E T 432 STRUCTURAL DESIGN-REINFORCED CONCRETE (3) Design of reinforced concrete beams, columns, slabs, and selected framing systems for bending and shear. Introduction to formwork design. Prerequisite: or concurrent: C E T 430

C E T 434 FOUNDATIONS (3) Analysis and design of footings, piling, retaining walls; consideration of contruction problems involving soils and foundations of structures. Prerequisite: C E T 243, C E T 431

C E T 435 CONSTRUCTION ESTIMATING (3) Methods and techniques used in estimating construction cost; practice in takeoffs, costing and final bid preparation; microcomputer applications/class projects. Prerequisite: C E T 332

C E T 436 ADVANCED STRUCTURAL DESIGN (3) Special systems, frames and bracing in steel, wood and reinforced or precast concrete. Introduction to composite construction. Prerequisite: C E T 430, C E T 431, C E T 432

C E T 437 ADVANCED STRUCTURAL ANALYSIS (3) Analysis of trusses and frame using matrix 1 computer methods. Analysis of indeterminate beams; trusses and frames using classical methods. Prerequisite: C E T 430

C E T 438 CONSTRUCTION MANAGEMENT II (3) Procedures in construction organization including procurement, ethics, field supervision, legal and managerial problems, personnel, cost accounting, and construction business practices. Prerequisite: C E T 332, C E T 452

C E T 452 PLANNING AND SCHEDULING (3) Theory and practice used in planning and scheduling projects; defining task and resources, creating logic diagrams, and monitoring the projects. Prerequisite: C E T 332, C E T 435

C E T 454 SAFETY (3) This course will focus on safety issues as they relate to OSHA. Prerequisite: permission from program

C E T 458 SENIOR PROJECT (4) This course consists of a project either selected by the students with approval or assigned by the instructor. Prerequisite: eighth-semester Structural Design and Construction Engineering student

C E T 470 FUNDAMENTALS OF AIR POLLUTION (3) Natural and man-made sources of pollution; atmospheric dispersion; biological and health effects; control systems; legislation and regulations. Prerequisite: fluid mechanics and chemistry
C E T 496 INDEPENDENT STUDIES (1–18)
C E T 497 SPECIAL TOPICS (1–9)

CIVIL ENGINEERING TECHNOLOGY (CE T)

College of Engineering
CE T118 ROUTE SURVEYING (2) Field and office operations connected with highway and railroad location; mass diagram as related to economical distribution of earthwork. Prerequisite: CE T 111 Concurrent: CE T 112
CE T 197 SPECIAL TOPICS (1–9)
CE T 216 SPECIAL SURVEYS (3) Applications of surveying in hydrography, mining, construction, and subdivision planning; surveying registration law and professional ethics. Prerequisite: CE T 112, CE T 113
CE T 261 FLUID FLOW (3) Elementary theory of fluid flow: hydrostatics; flow through orifices, Venturi meters, and pipes; flow in open channels; theory of the centrifugal pump. Prerequisite: MCH T 111
CE T 297, 298 SPECIAL TOPICS (1–9)

CLASSICS AND ANCIENT MEDITERRANEAN STUDIES (CAMS)

College of the Liberal Arts
CAMS 001 (GH) GREEK AND ROMAN LITERATURE (3) Selected readings within a chronological and thematic context of significant and influential masterworks of Greece and Rome.
CAMS 004 (GH;GI) (J ST;RL ST) JEWISH AND CHRISTIAN FOUNDATIONS (3) Introduction to the perspectives, patterns of worship, morality, historical roots, and institutions of the Judaeo-Christian traditions; their relationships to culture.
CAMS 010 (GH) MESOPOTAMIAN CIVILIZATION (3) Cultural, technological, literary, political, and economic achievements of peoples who occupied the region of Mesopotamia (4,000-331 B.C.E.), in historical context.
CAMS 012 (GH;GI) (J ST;RL ST) LANDS OF THE BIBLE (3) Textual and archaeological evidence for the lands, cities, and peoples associated with the Hebrew Bible and Christian scriptures.
CAMS 015 (GH) WONDERS OF THE ANCIENT WORLD (3) Overview of ancient world by focusing on the famed "Seven Wonders" and similar achievements from 3000 B.C.E.-1st Century C.E.
CAMS 020 (GH) EGYPTIAN CIVILIZATION (3) The culture, history, literature, and archaeology of ancient Egypt from the dawn of history to the Greco-Roman period.
CAMS 025 (GH;GI) GREEK CIVILIZATION (3) The origin and development of the ancient Greek people; their political and social institutions, public and private life.
CAMS 033 (GH;GI) ROMAN CIVILIZATION (3) Origin of the Romans; sociopolitical development; food, homes; education, marriage, family life, amusements; private and public worship.
CAMS 034 LATIN LITERATURE IN ENGLISH TRANSLATION (3) Readings in the major Latin authors (Plautus, Terence, Lucretius, Catullus, Horace, Vergil, Livy, Tacitus, Petronius); their influence on later literature.
CAMS 044 (GH;GI) (RL ST) ANCIENT NEAR EASTERN AND EGYPTIAN MYTHOLOGY (3) Survey of major ancient Mediterranean myths, gods, and goddesses in their cultural contexts; influence on later cultures.
CAMS 045 (GH;GI) CLASSICAL MYTHOLOGY (3) Introduction to Greek and Roman divinities, heroes and heroines; survey of the major myths and their influence on Western culture.
CAMS 050 (GH) WORDS: CLASSICAL SOURCES OF ENGLISH VOCABULARY (3) An introduction to English word forms stressing the most frequently occurring Latin and Greek elements and their derivatives.
CAMS 083S (GH;GI) FIRST-YEAR SEMINAR IN CLASSICS AND ANCIENT MEDITERRANEAN STUDIES (3) Critical approach to the study of ancient Mediterranean languages, literatures, and/or material cultures.
CAMS 099 (GI) FOREIGN STUDIES (1–12)
CAMS 100 (GH) (HIST) ANCIENT GREECE (3) Greek world from the earliest Aegean cultures to the death of Alexander the Great and the beginnings of Hellenistic civilization.
CAMS 101 (GH) (HIST) THE ROMAN REPUBLIC AND EMPIRE (3) History of the Roman Republic and Empire from the origins of Rome to the disintegration of the Empire.
CAMS 102 (GH;GI) (HIST;J ST;RL ST) CANAAN AND ISRAEL IN ANTIQUITY (3) Political, social, and intellectual history of the land of Canaan/Israel in the Biblical era: Late Bronze and Iron Ages.
CAMS 104 (GH) (HIST) ANCIENT EGYPT (3) The history and archaeology of ancient Egypt from the dawn of history to the Greco-Roman period.
CAMS 110 (GH;GI) (J ST;RL ST) HEBREW BIBLE: OLD TESTAMENT (3) Introduction to the history, literature, and religion of ancient Israel.
CAMS 111 (GH;GI) (J ST;RL ST) EARLY JUDAISM (3) Religious thought, practices, and parties in the Second Temple period; the emergence of rabbinic Judaism.
CAMS 120 (GH) (J ST;RL ST) NEW TESTAMENT (3) Introduction to the history, literature, and religion of early Christianity in the Jewish-Hellenistic setting.
CAMS 124 (GH;GI) (J ST;RL ST) EARLY AND MEDIEVAL CHRISTIANITY (3) Analysis in cultural context of selected thinkers, ideas, and movements in Christianity from the second through the fifteenth century.

CAMS 133 (GH) (J ST;RL ST) ARCHAEOLOGY OF THE LEVANT AND ANCIENT ISRAEL (3) Archaeology of the Levant and Ancient Israel to c. 1000 B.C.E.; relationship between archaeological and textual evidence.
CAMS 134 (GH;GI) (J ST;RL ST) ARCHAEOLOGY OF BIBLICAL ISRAEL (3) Archaeology of Biblical Israel from 1200 B.C.E. to c. 640 C.E.; relationship between archaeological and textual evidence.
CAMS 140 (GH;GI) CLASSICAL ARCHAEOLOGY—ANCIENT GREECE (3) Literary sources and material evidence for society; culture of the inhabitants of Greece in ancient times.
CAMS 150 (GH;GI) CLASSICAL ARCHAEOLOGY—ANCIENT ROME (3) Literary sources for the development of Roman civilization in relation to the relevant archaeological discoveries.
CAMS 197 SPECIAL TOPICS (1–9)
CAMS 199 (GI) FOREIGN STUDIES (1–12)
CAMS 200 (GH) (PHIL) ANCIENT PHILOSOPHY (3) Examines the thought and influence of major Western thinkers from the pre- Socratics to the neo-Platonists, emphasizing Plato and Aristotle.
CAMS 294 RESEARCH PROJECT (1–12)
CAMS 295 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
CAMS 296 INDEPENDENT STUDIES (1–18)
CAMS 297 SPECIAL TOPICS (1–9)
CAMS 299 (GI) FOREIGN STUDIES (1–12)
CAMS 395 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
CAMS 399 (GI) FOREIGN STUDIES (1–12)
CAMS 400W COMPARATIVE STUDY OF THE ANCIENT MEDITERRANEAN WORLD (3) Comparative study of ancient Mediterranean civilizations. Prerequisite: 3 credits in Classics and Ancient Mediterranean Studies
CAMS 410 CLASSICAL EPIC (3) Homer, Hellenistic Epic, and Vergil; influences on later epic.
CAMS 411W CLASSICAL DRAMA (3) Masterpieces of Greek tragedy (Aeschylus, Sophocles, Euripides) and comedy (Aristophanes, Menander); their influence on Roman writers.
CAMS 440W STUDIES IN CLASSICAL AND ANCIENT MEDITERRANEAN ARCHAEOLOGY (3–6) Selected topics in the literary sources and material evidence for classical and ancient Mediterranean society. Prerequisite: 3 credits from: ANTH 002, ART H 311, CAMS 010, CAMS 020, CAMS 025, CAMS 033, CAMS 140, CAMS 150, HIST 100, HIST 101
CAMS 442 (KINES) SPORT IN ANCIENT GREECE AND ROME (3) An examination of the continuity of sport in Greek and Roman societies. Prerequisite: CAMS 025, CAMS 033, CAMS 140, CAMS 150, CAMS 100 or CAMS 101
CAMS 480 (J ST) GREEKS AND PERSIANS (3) Development and achievements of the Achaemenid kingdom; relationships between Persians and Greeks. Prerequisite: CAMS 010, CAMS 025, or CAMS 100
CAMS 490 ANCIENT MEDITERRANEAN LANGUAGES (3–6) Variable topic study of an ancient language of the Mediterranean basin and related areas, other than Greek, Latin, or Hebrew. Prerequisite: GREEK 003 or LATIN 003
CAMS 492 INTERMEDIATE FIELD METHODS (3–6) On-site experience in archaeological fieldwork in the ancient Mediterranean region. Prerequisite: approval by field school director
CAMS 493 INTERMEDIATE FIELD ANALYSIS (3–6) On-site experience in archaeological analysis in the ancient Mediterranean region. Prerequisite: approval by field school director
CAMS 494 RESEARCH PROJECT (1–12)
CAMS 494H RESEARCH PROJECT (1–12)
CAMS 495 INTERNSHIP (1–18)
CAMS 496 INDEPENDENT STUDIES (1–18)
CAMS 497 SPECIAL TOPICS (1–9)
CAMS 499 (GI) FOREIGN STUDIES (1–12)

COMMONWEALTH COLLEGE (CWC)

CWC 097, 098, 197, 198, 297, 298, 397, 398, 497, 498 SPECIAL TOPICS (1–9)
CWC 099, 199, 299, 399, 499 (GI) FOREIGN STUDIES (1–12)
CWC 294, 494 RESEARCH PROJECT (1–12)
CWC 295, 395, 495 INTERNSHIP (1–18)
CWC 296, 496 INDEPENDENT STUDIES (1–18)

COMMUNICATION (COMMU)

Penn State Erie, The Behrend College
COMMU001 NEWSPAPER PRACTICUM (1 per semester, maximum of 8) A practicum in news writing, editing, and production of the Behrend College student newspaper.
COMMU 002 NEWSPAPER EDITORIAL STAFF (2–3 per semester, maximum of12) A practicum in serving as section editor or editor-in-chief of the Behrend College student newspaper. Prerequisite: COMMU 001

COMMU 003 RADIO PRACTICUM (1 per semester, maximum of 8) A practicum in radio production and broadcasting on WPSE, the Behrend College student radio station.
COMMU 097, 197, 297, 397, 497 SPECIAL TOPICS (1–9)
COMMU 197 SPECIAL TOPICS (1–9)
COMMU 296 INDEPENDENT STUDIES (1–18)
COMMU 300 INTRODUCTION TO COMMUNICATION AND MEDIA TECHNOLOGIES (3) Introduction to existing and emerging communication technology and examination of its impact on the communication process. Prerequisite: fifth-semester standing
COMMU 301 INTRODUCTION TO MEDIA WRITING (3) Tutorial and practice in various kinds or journalistic and commercial writing, emphasizing basic skills. Prerequisite: ENGL 202A, ENGL 202B, ENGL 202C, or ENGL 202D
COMMU 305 INTRODUCTION TO PUBLIC RELATIONS STRATEGIES AND CAMPAIGNS (3) Analyze public relations campaigns and introduction to their strategies and methods. Prerequisite: ENGL 202A, ENGL 202B, ENGL 202C, or ENGL 202D; COMMU 301
COMMU 310 INTRODUCTION TO COMMUNICATION RESEARCH (3) An introduction accessing, gathering, analyzing and interpreting communication research, and designing and conducting basic communication research studies. Prerequisite: ENGL 202, CMPSC 203
COMMU 312 PROFESSIONAL PUBLIC SPEAKING (3) Organizing, adapting and presenting ideas in public informative, persuasive, technical and ceremonial speeches. Prerequisite: SPCOM 100
COMMU 315 SURVEY OF INTERPERSONAL COMMUNICATION THEORY AND PRACTICE (3) Introduction to the field of interpersonal communication through an examination of major theories and their implications for skill development. Prerequisite: fifth-semester standing
COMMU 317 COMMUNICATION FOR TEACHERS (3) Analysis of dynamics of instructor-student communication implemented through structured exercises in instructor listening, verbal and nonverbal message- making. Prerequisite: CAS 100
COMMU 319 COMMUNICATION AND CIVILITY (3) Communication behaviors contributing to civil and uncivil discourse; their implications in business, public life, across cultures and in interpersonal relationships.
COMMU 325 SPEECH COMMUNICATION IN ORGANIZATIONS (3) Introduction to interviewing, briefing, conferring, and decision making: analyzing and evaluating formal and informal patterns of communication in organizations. Prerequisite: SPCOM 100, fifth-semester standing
COMMU 383 INTRODUCTION TO AUDIO/VIDEO PRODUCTION (3) Introduction to the basic formal and technical elements of audio and video production.
COMMU 400 GLOBAL MEDIA (3) The globalization of the mass media, its impact on mass audiences, and development of strategies to evaluate economic, social, and political forces shaping it. Prerequisite: CAS 100 or COMM 100; and fifth-semester standing
COMMU 401W ADVANCED WRITING AND EDITING FOR THE BUSINESS AND TECHNICAL JOURNALIST (3) Advanced course in writing and editing for the trade press (business/technical/industrial journalism). Prerequisite: COMMU 301
COMMU 402 (GI) INTERCULTURAL COMMUNICATION (3) Analysis of communication processes as affected by national cultures; effects of differences in language, values, meaning, perception, and thought. Prerequisite: SPCOM 100, fifth-semester standing
COMMU 403 ELECTRONIC NEWS GATHERING AND EDITING (3) Intermediate level skills in creating and editing television news packages. Prerequisite: COMMU 301, COMMU 383
COMMU 404 MEDIA ETHICS (3) Examination of rights and consequent responsibilities inherent in the "free press" guarantees of the First Amendment of the "Constitution." Prerequisite: COMMU 301
COMMU 405 ADVANCED PUBLIC RELATIONS CAMPAIGNS AND STRATEGIES (3) Examination and application of strategies for public relations campaigns. Prerequisite: COMMU 305
COMMU 416 RHETORICAL CRITICISM IN PUBLIC AFFAIRS (3) Examination of methods of rhetorical criticism and application of its theories to contemporary socio-political organizations. Prerequisite: CAS 100 or CAS 201
COMMU 425 ORGANIZATIONAL COMMUNICATION ANALYSIS AND IMPROVEMENT (3) An examination of communication in organizations emphasizing the types, contexts, effects, problems, and improvement of communication in organizations through consulting. Prerequisite: COMMU 325
COMMU 430 SMALL GROUPS AND LEADERSHIP IN ORGANIZATIONS (3) Examination and development of communication skills required for effective participation in and leadership of groups in organizations. Prerequisite: COMMU 325
COMMU 483 ADVANCED AUDIO VIDEO PRODUCTION (3) Advanced techniques in video production applied to narrative, non-narrative and short documentary formats. Prerequisite: COMMU 383
COMMU 494 SENIOR PROJECT IN COMMUNICATION (3) An opportunity for Communication and Media Studies majors to apply communication skills in an extended research project. Prerequisite: seventh-semester standing, completion of all prescribed course work, and an approved proposal
COMMU 495 INTERNSHIP (1–18 per semester) Supervised off-campus, nongroup instruction including field experiences, practica, internships. Written and oral critiaue of activity required. Prerequisite: prior approval of proposed assignment by instructor
COMMU 496 INDEPENDENT STUDIES (1–18)

COMMUNICATION ARTS AND SCIENCES (C A S)

College of the Liberal Arts

CAS 083S (GS) FIRST-YEAR SEMINAR IN SPEECH COMMUNICATION (3) Introduction to major theoretical, critical, research and pedagogical issues in human communication.

CAS 084S (GH) FIRST-YEAR SEMINAR IN COMMUNICATION ARTS AND SCIENCES (3) Introduction to significant issues surrounding effective human communication; humanities emphasis.

CAS 100 (GWS) EFFECTIVE SPEECH (3) Introduction to speech communication: formal speaking, group discussion, analysis and evaluation of messages.

CAS 100A (GWS) EFFECTIVE SPEECH (3) Principles of communication, implemented through presentation of speeches, with some attention to group discussion and message evaluation.

CAS 100B (GWS) EFFECTIVE SPEECH (3) Principles of communication, implemented through group problem solving, with some attention to formal speaking and message evaluation.

CAS 100C (GWS) EFFECTIVE SPEECH (3) Principles of communication, implemented through analysis and evaluation of messages, with some attention to formal speaking and group discussion.

CAS 100S (GWS) EFFECTIVE SPEECH (3) Principles of communication, implemented through presentation of speeches, with some attention to group discussion and message evaluation.

CAS 101 (GS) INTRODUCTION TO HUMAN COMMUNICATION (3) Introduction to major theoretical, critical, research and pedagogical issues in human communication.

CAS 126 DEVELOPMENTAL LISTENING (3) Introduction to effective strategies of listening, with an emphasis on studying, note taking, test taking, and research paper writing.

CAS 175 (GH) PERSUASION AND PROPAGANDA (3) An introductory examination of how symbols have been used to create belief and action in revolutionary, totalitarian, and democratic settings.

CAS 195 CAREERS IN COMMUNICATION (1) An introduction to a variety of careers in the field of communication arts and sciences.

CAS 197, 297, 497 SPECIAL TOPICS (1–9)

CAS 199 (GI) FOREIGN STUDIES (1–12)

CAS 200 (GI) LANGUAGE, CULTURE, AND COMMUNICATION (3) Introduction to language, language development, cultural literacy, culture, and intercultural communication.

CAS 201 (GH) RHETORICAL THEORY (3) History and theory of public advocacy and civic discourse.

CAS 202 (GS) INTRODUCTION TO COMMUNICATION THEORY (3) Survey of human communication studies in relational, interpersonal, group, organization, intercultural, health, technology and commuication systems.

CAS 203 (GS) INTERPERSONAL COMMUNICATION (3) Exploration of competent communication and the skills necessary to manage personal and professional relationships.

CAS 204 COMMUNICATION RESEARCH METHODS (3) Overview of the skills necessary to evaluate commonly reported communication research.

CAS 205 THE VOICE AND ITS USE (3) Emphasis on procedures to improve vocal effectiveness in personal and professional communication; not offered at University Park campus.

CAS 211 INFORMATIVE SPEAKING (3) Planning, organizing, adapting, and presenting informative speeches and oral reports on technical/scholarly projects, both by manuscript reading and extemporaneously. Prerequisite: CAS 100

CAS 213 PERSUASIVE SPEAKING (3) Planning, organizing, and adapting techniques of persuasion to achieve personal and public goals; engaging in critical assessment of persuasive messages. Prerequisite: SPCOM 100

CAS 214W SPEECH WRITING (3) Writing speeches for delivery in political, professional, and ceremonial settings; emphasis on composition and language for oral presentation. Prerequisite: SPCOM 100

CAS 215 ARGUMENTATION (3) Theory of argument: gathering of evidence, analysis of proposition, case building, cross-examination, refutation, composition and delivery of argumentative speech.

CAS 216 PARLIAMENTARY PROCEDURE (2) Practice in presiding over and participating in meetings conducted under rules of order.

CAS 250 SMALL GROUP COMMUNICATION (3) Skill development in the areas of group discussion, leadership, and teamwork.

CAS 252 BUSINESS AND PROFESSIONAL COMMUNICATION (3) Interviewing, briefing, conferring, and decision making; analyzing and evaluating formal and informal patterns of communication in organizations.

CAS 271 (GI) INTERCULTURAL COMMUNICATION (3) Introduction to intercultural communication. Focus on topics such as language, identity, prejudice, and intergroup relations on a domestic/ international level.

CAS 280W STORYTELLING AND SPEAKING (3) Principles of oral performance from storytelling to the printed page; includes oral performance of stories, speeches, prose, drama, and poetry.

CAS 283 COMMUNICATION AND INFORMATION TECHNOLOGY I (3) Introduction to communication technology and information management; intended for students in the Liberal Arts.

CAS 294 RESEARCH TOPICS (1–12) Supervised student activities on research projects identified on an individual or small group basis. Prerequisite: prior approval of assignment by instructor

CAS 295 INTERNSHIP (1–16) Prerequisite: prior approval of proposed assignment by instructor

CAS 296, 496 INDEPENDENT STUDIES (1–18)

CAS 298, 398, 498 SPECIAL TOPICS (1–9)

CAS 299, 399, 499 (GI) FOREIGN STUDIES (1–12)

CAS 302 SOCIAL INFLUENCE (3) Explores how humans influence others through communication.
CAS 311 METHODS OF RHETORICAL CRITICISM (3) Principles for the analysis and evaluation of public discourse.
CAS 321 RHETORIC AND LAW (3) A survey of the literature on the role of rhetoric in law, including trial advocacy, appellate argument, and judicial reasoning.
CAS 352 ORGANIZATIONAL COMMUNICATION (3) This course examines the function and structure of communication in both formal and informal situations.
CAS 353 HEALTH COMMUNICATION (3) To introduce students to principles of health message design and the general theories and models used to guide these efforts.
CAS 375 RHETORIC AND PUBLIC CONTROVERSY (3) Survey of important events in the history of public address, including speeches, debates, and persuasive campaigns and movements.
CAS 383 CULTURE AND TECHNOLOGY (3) This course will examine the area of cyberculture as it relates to communication studies.
CAS 395 FORENSICS PRACTICUM (1–2 per semester, maximum of 16) Provides students in forensics the opportunity for supervised participation in the activity in class and in intercollegiate competition.
CAS 402 SPEECH AND HUMAN BEHAVIOR (3) General semantics, thought, and human behavior; not offered at University Park campus.
CAS 403 INTERPERSONAL COMMUNICATION THEORY AND RESEARCH (3) Examining behavior within interpersonal encounters, with emphasis on both theoretical/applied explanations for how and why people act during such interactions. Prerequisite: CAS 203
CAS 404 CONFLICT RESOLUTION AND NEGOTIATION (3) Theories and strategies important for conceptualizing, developing, and managing conflict negotiation, mediation, and third-party intervention. Prerequisite: SPCOM 100
CAS 405 FAMILY COMMUNICATION THEORY AND RESEARCH (3) Explores the nature and functions of communication in family life; emphasis on meaning, patterns, and styles of family communication. Prerequisite: CAS 101, CAS 202
CAS 406H HONORS COURSE IN COMMUNICATION ARTS AND SCIENCES (3) Individual study and seminar in selected areas or issues of speech communication. Prerequisite: an all-University average of B; approval of the departmental Honors Committee
CAS 411 RHETORICAL CRITICISM (3) Principles of rhetorical criticism examined through analysis of selected texts and critics. Prerequisite: CAS 201 or SPCOM 100
CAS 415 RHETORIC OF FILM AND TELEVISION (3) Rhetorical analysis of the artistic forms and cultural structures of film and television; intensive study of selected examples. Prerequisite: CAS 100 or COMM 150
CAS 420 RHETORICAL THEORY (3) Ancient, medieval, Renaissance, Enlightenment, and contemporary theories of rhetoric. Prerequisite: CAS 201
CAS 422 (GI) (AAA S) CONTEMPORARY AFRICAN AMERICAN COMMUNICATION (3) A focused study on the continuities between African and African American culture and communication. Prerequisite: SPCOM 100
CAS 426W COMMUNICATION ETHICS (3) Ethical issues in public and private communication; role of communication in expressing and realizing individual and social values. Prerequisite: SPCOM 100
CAS 438 RHETORIC OF DOCUMENTARY (3) Rhetorical analysis of the documentary in film, television, and other media; historical and critical analysis of functions and form. Prerequisite: CAS 201
CAS 450W GROUP COMMUNICATION THEORY AND RESEARCH (3) Selected theories of problem solving through group discussion emphasizing participation and leadership. Prerequisite: CAS 100 or CAS 250
CAS 452 ORGANIZATIONAL COMMUNICATION THEORY AND RESEARCH (3) Explores the nature and functions of communication in organizations; emphasis on concepts, tools, and skills for effective management of communication. Prerequisite: CAS 202 or CAS 252
CAS 452W ORGANIZATION COMMUNICATION THEORY AND RESEARCH (3) Explores the nature and functions of communication in organizations; emphasis on writing and exploring concepts, tools, and skills for effective management of communication. Prerequisite: CAS 202 or CAS 252
CAS 453 HEALTH COMMUNICATION THEORY AND RESEARCH (3) Principles of communication about health across the lifespan and within health-care contexts. Prerequisite: CAS 353
CAS 455 (GI) (WMNST) GENDER ROLES IN COMMUNICATION (3) Explores the literature on gender research in the discipline of human communication. Prerequisite: CAS 202
CAS 470 NONVERBAL COMMUNICATION (3) Examining ways nonverbal messages, such as gestures, posture, vocal intonation, and facial expressions, affect us on a daily basis. Prerequisite: 6 credits in speech communication
CAS 471 (GI) INTERCULTURAL COMMUNICATION THEORY AND RESEARCH (3) Intercultural and cross-cultural communication research theory and practice as applied within and across national boundaries. Prerequisite: CAS 271
CAS 475 STUDIES IN PUBLIC ADDRESS (3) History and criticism of public discourse; intensive analysis of selected public addresses and social movements. Prerequisite: SPCOM 100
CAS 478 CONTEMPORARY AMERICAN POLITICAL RHETORIC (3) Analysis of selected speeches, debates, and persuasive campaigns and movements in recent American political history. Prerequisite: CAS 100
CAS 480 GROUP PERFORMANCE OF LITERATURE (3) Applying storytelling skills and performance theory to the group presention of literature; criticism of literature through group presentations. Prerequisite: SPCOM 100

CAS 483 COMMUNICATION AND INFORMATION TECHNOLOGY II (3) Theory and application of interactive internet-based communication and information management; for students who want a Liberal Arts approach. Prerequisite: SPCOM 283
CAS 494 RESEARCH TOPICS (1–12) Supervised student activities on research projects identified on an individual or small group basis. Prerequisite: prior approval of proposed assignment by instructor
CAS 495 INTERNSHIP (1–18) Prerequisite: prior approval of proposed assignment by instructor

COMMUNICATION SCIENCES AND DISORDERS (C S D)

College of Health and Human Development
CSD 100 (GHA) PREVENTING VOCAL ABUSE, MISUSE, AND DISORDERS (1.5) Principles of the voice mechanisms, preventing vocal abuse, and promoting vocal health across the life span.
CSD 101 (GHA) PREVENTING HEARING LOSS (1.5) Assessment, intervention, and prevention of hearing loss caused by loud music and recreational and industrial noise.
CSD 146 INTRODUCTION TO COMMUNICATION SCIENCES AND DISORDERS (3) Classification of speech, language, and hearing disorders, diagnostic and treatment procedures; skills and responsibilities of the speech-language pathologist and audiologist.
CSD 218 AMERICAN SIGN LANGUAGE I (3) Introduction to sign language; provides basic receptive and expressive skills; includes out-of-class practice.
CSD 230 INTRODUCTION TO AUDIOLOGY (3) Basic measurement procedures, evaluation, and screening of hearing loss using pure-tone and speech audiometry, immittance, and physiological measurements.
CSD 245 PROFESSIONAL PROGRAMS AND RELATIONSHIPS (2) Organization and administration of speech pathology and audiology programs in various professional settings; personal, professional, and community relationships and responsibilities. Prerequisite: or concurrent: CSD 146
CSD 269 (GI) DEAFNESS AND SOCIETY (3) Explores the economic, social, psychological, and political aspects of the deaf culture and its interaction with the majority hearing culture.
CSD 296, 496 INDEPENDENT STUDIES (1–18)
CSD 297, 497 SPECIAL TOPICS (1–9)
CSD 300 DEVELOPMENTAL CONSIDERATIONS IN THE ASSESSMENT AND TREATMENT OF LANGUAGE DIS ORDERS (3) Using a developmental framework to interpret problems in child language acquisition.
CSD 301 ACOUSTIC PRINCIPLES IN COMMUNICATION SCIENCES AND DISORDERS (3) Explores the fundamental concepts of acoustics as applied to individuals with communicative disabilities; special emphasis is placed on the acoustic analysis of speech.
CSD 311 CLINICAL PHONETICS (3) Introducton to phonetic transcription of speech emphasizing articulatory phonetics of American English, its dialects, and disordered speech; extensive transcription experiences.
CSD 318 AMERICAN SIGN LANGUAGE II (3) Review of basic signing, plus continued development of signing skills. Prerequisite: CSD 218
CSD 331 ANATOMY AND PHYSIOLOGY FOR SPEECH AND HEARING (3) Structure and function of the physical systems involved in speech and hearing, including respiration, phonation, articulation, perception, and neurology.
CSD 395W CLINICAL OBSERVATIONS IN COMMUNICATION DISORDERS (1) Systematic observation of therapy and diagnostic sessions in speech-language pathology and audiology. Prerequisite: CSD 146
CSD 418 AMERICAN SIGN LANGUAGE III (3) Development of advanced skills in sign language. Prerequisite: CSD 318
CSD 419 AMERICAN SIGN LANGUAGE IV (3) Development of advanced and interpreter skills in sign language. Prerequisite: CSD 418
CSD 433 AURAL REHABILITATION (3) Methods for improving receptive skills of persons with hearing impairments; clinical observation and practice. Prerequisite: CSD 230
CSD 442 INTRODUCTION TO DISORDERS OF ARTICULATION AND PHONOLOGY (3) Etiology, diagnosis, and treatment of articulation disorders. Prerequisite: CSD 146, CSD 311, CSD 331
CSD 444 INTRODUCTION TO ORGANIC DISORDERS OF SPEECH AND LANGUAGE (3) Etiology, diagnosis, and principles of treatment of stuttering, and of speech–language disorders having organic bases. Prerequisite: CSD 146, CSD 331
CSD 451 AN INTRODUCTION TO AUGMENTATIVE AND ALTERNATIVE COMMUNICATION (3) Examination of assessment and intervention issues in augmentative and alternative communication techniques with persons with severe communication disorders. Prerequisite: CSD 146, CSD 300
CSD 459W PRINCIPLES OF CLINICAL MANAGEMENT IN COMMUNICATION DISORDERS (3) Survey of principles and practices for diagnosing, interviewing, counseling, treating, reporting, and programming in Communication Disorders. Prerequisite: CSD 146
CSD 462 CLINICAL BASES OF LANGUAGE DISORDERS (3) Description of pathological language and cognitive development, and principles of assessment and remediation among individuals with communication disorders. Prerequisite: CSD 300
CSD 495A SPEECH THERAPY PRACTICUM (1–6) Demonstration and practice in examination, diagnosis, and treatment of speech problems. Prerequisite: CSD 395W, CSD 442
CSD 495B AUDIOLOGY PRACTICUM (1–5) Demonstration and practice in examination, diagnosis, and treatment of hearing impairment problems. Prerequisite: CSD 395W, CSD 433

COMMUNICATIONS (COMM)

College of Communications

COMM 100 (GS) THE MASS MEDIA AND SOCIETY (3) Mass communications in the United States: organization, role, content, and effects of newspapers, magazines, television, radio, books, and films.

COMM 120 ADVERTISING AND SOCIETY (3) History and structure of advertising in American society; the role of advertising in the economic and communications systems; regulation. May not be used to fulfill requirements of any major in the School of Communications.

COMM 150 (GA) THE ART OF THE CINEMA (3) The development of cinema to its present state; principles of evaluation and appreciation; examples from the past and present.

COMM 160 BASIC NEWS WRITING SKILLS (1) Grammar, punctuation, spelling, and word usage skills required of journalists.

COMM 180 SURVEY OF BROADCASTING AND CABLE (3) Introductory study of American broadcasting system; history and technological development; societal compulsions and constraints on programming and practices.

COMM 197 SPECIAL TOPICS (1–9)

COMM 205 (GI) (WMNST) WOMEN, MINORITIES, AND THE MEDIA (3) Analysis of historical, economic, legal, political, and social implications of the relationship between women, minorities, and the mass media.

COMM 230 BEGINNING NONFICTION WRITING WORKSHOP (3–6 per semester) Study and practice of the principles of researching and writing nonfiction articles for periodicals. Prerequisite: ENGL 015 OR ENGL 030

COMM 242 BASIC VIDEO/FILMMAKING (3) Introduction to basic motion picture techniques, emphasizing practical experience in filmmaking. Prerequisite: COMM 250

COMM 250 (GA) FILM HISTORY AND THEORY (3) Exploration of film theory and criticism in the context of aesthetic, technological, and economic evolution of film history. Prerequisite: COMM 150

COMM 250 (GA) FILM HISTORY AND THEORY (3) Exploration of film theory and criticism in the context of aesthetic, technological, and economic evolution of film history. Prerequisite: COMM 150

COMM 260W NEWS WRITING AND REPORTING (3) News and news values; legal and ethical problems of reporting; writing and reporting news for the mass media. Prerequisite: ENGL 015 or ENGL 030; COMM 160; third-semester standing and typing proficiency

COMM 261 (GH) THE LITERATURE OF JOURNALISM (3) Representative nonfiction by writers such as Susan Sheehan, George Orwell, Joan Didion, Alice Walker, Truman Capote, C. D. B. Bryan, Russell Baker.

COMM 269 PHOTOJOURNALISM (3) Photography as a medium for communication; creating photographs and photoessays for newspapers and magazines; camera and darkroom techniques. Prerequisite: COMM 260W or COMM 320

COMM 270 INTRODUCTION TO MULTIMEDIA PRODUCTION (3) Introduction to multimedia project activities to explore image editing, layout, the integration of texts and images and web architecture.

COMM 283W INTRODUCTION TO AUDIO AND VIDEO COMMUNICATIONS (3) Introduction to audio and video studio procedures and techniques within the context of human communication.

COMM 294 RESEARCH PROJECT COURSES (1–12)

COMM 296 INDEPENDENT STUDIES (1–18)

COMM 297 SPECIAL TOPICS (1–9)

COMM 299 (GI) FOREIGN STUDIES (1–12)

COMM 300H RESEARCH AND WRITING FOR THE MASS MEDIA (3) Instruction and practice in research and writing of nonfiction articles suitable for publication. Prerequisite: fourth-semester standing; admission to the University Scholars Program

COMM 320 INTRODUCTION TO ADVERTISING (3) Advertising management in business, including communication theory; common industry practices; basics of copy, media, and budget decision; and environmental influences. A student may not receive credit for both COMM 320 and MKTG 322. Prerequisite: fourth-semester standing

COMM 337 THEORY AND PRACTICE OF PRODUCTION (3) Analysis and theory of production process combined with projects exploring alternative and documentary forms. Prerequisite: COMM 242

COMM 340 PRODUCTION TECHNOLOGY AND TECHNIQUE TOPICS I (3) Intensive practical experience and studies of camera, lighting, audio, and editing. Prerequisite: COMM 242

COMM 342W INTERMEDIATE FILM AND VIDEO PRODUCTION I (6) A comprehensive approach to the film and video production process including writing for the screen, directing, and film and video production. Exploration through the production of nonsynchronous 16mm film and video projects. Designed primarily for Film/Video Majors. Prerequisite: COMM 242

COMM 345 PRODUCTION AND DIRECTION (3) An intermediate-level course on directing and production technique for film. Prerequisite: COMM 242

COMM 346 WRITING FOR THE SCREEN I (3) A beginning course in narrative Screenwriting emphasizing analysis, creativity, and critiquing skills necessary for the development of storytelling. Prerequisite: COMM 242

COMM 347 INTERMEDIATE VIDEO/FILMMAKING (3) Exploration of narrative, documentary, and experimental forms through the production of 16mm film and video projects. Prerequisite: COMM 242

COMM 360 BROADCAST JOURNALISM I (3) Reporting, writing, producing, and presenting radio news programs, focusing on the development of news judgment and writing skills. Prerequisite: or concurrent: COMM 260W

COMM 370 PUBLIC RELATIONS (3) Public understanding of organizations and institutions; identification and analysis of public; media relations; public relations practice. Prerequisite: fourth-semester standing
COMM 381 TELECOMMUNICATIONS REGULATION (3) Overview of the regulation of electronic media. Prerequisite: COMM 180; ECON 002 or ECON 014
COMM 383 PRODUCTION ADMINISTRATION (3) Management, production, and analysis of video programming for mass and submass audiences. Emphasis on single-camera field production. Prerequisite: COMM 283W
COMM 384 TELECOMMUNICATIONS PROMOTION AND SALES (3) Principles of marketing services applied to telecommunications and information products/services; models of customer-focused selling and their applications to media time sales. Prerequisite: COMM 180 or COMM 320
COMM 385 BROADCAST AND CABLE PROGRAMMING (3) Framework, principles, and strategies for the programming of Broadcast television, Cable television, and radio stations. Prerequisite: COMM 180
COMM 386 TELECOMMUNICATIONS HISTORY (3) Historical development of telecommunications systems in the United States, including telegraph, telephone, radio, television, and the internet.
COMM 387 INTRODUCTION TO BROADCAST/CABLE MANAGEMENT (3) Introduction to basic principles of management as they apply in electronic media industries. Prerequisite: COMM 180; ECON 002 or ECON 014
COMM 401 MASS MEDIA IN HISTORY (3) Relationship of news media to social, economic, and political developments in the Western world.
COMM 403 LAW OF MASS COMMUNICATIONS (3) Nature and theories of law; the Supreme Court and press freedom; legal problems of the mass media.
COMM 404 MASS COMMUNICATION RESEARCH (3) Introduction to social science research methods in a mass communication context. Prerequisite: or concurrent: COMM 413W, STAT 200
COMM 405 POLITICAL ECONOMY OF COMMUNICATIONS (3) Structure and functions of American and other mass communications systems and their relationship to political and economic systems. Prerequisite: ECON 002
COMM 407 ADVERTISING IN THE AMERICAN ECONOMY (3) Economic organization and the nature of economic institutions; evolution of advertising; its performance in the American economy. Prerequisite: ECON 002
COMM 408 (S T S) CULTURAL FOUNDATIONS OF COMMUNICATIONS (3) Examination of oral, scribal, print, industrial, and electronic cultures; analysis of impact of technology on communications and social structure.
COMM 409 NEWS MEDIA ETHICS (3) Ethical problems in the practice of journalism, advertising, and public relations; principal public criticisms of news media; case study approach.
COMM 410 INTERNATIONAL MASS COMMUNICATIONS (3) The role of international media in communication among and between nations and people. Complement to COMM 419.
COMM 411 CULTURAL ASPECTS OF THE MASS MEDIA (3) The mass media as creators and critics of mass culture in American life; relationships between the media and mass culture. Prerequisite: 6 credits in the arts or the humanities
COMM 413 THE MASS MEDIA AND THE PUBLIC (3) Nature of mass communications, relationships between mass media and public, media influences on opinion; social pressures on the media.
COMM 417 ADVERTISING REGULATION AND ETHICS (3) History of advertising regulation; practitioner perspectives on formal and informal regulation; criticism of specific advertising practices. Prerequisite: COMM 320
COMM 418 MEDIA EFFECTS (3) Investigation of social/psychological effects of media messages and technologies via theories and empirical evidence pertaining to processes of effects. Prerequisite: COMM 100, COMM 404, COMM 413
COMM 419 WORLD MEDIA SYSTEMS (3) Comparative study of modern media systems of mass communications in selected foreign countries.
COMM 420 RESEARCH METHODS IN ADVERTISING AND PUBLIC RELATIONS (3) Primary and secondary research methods used in the development of solutions to advertising and public relations problems. Prerequisite: COMM 320 or COMM 370; STAT 200
COMM 421W ADVERTISING CREATIVE STRATEGIES (3) Planning, designing, writing advertisements; introduction to graphics and production techniques and processes; layout and copywriting practice and critiques. Prerequisite: COMM 320
COMM 422 ADVERTISING MEDIA PLANNING (3) Analysis, selection, and scheduling of advertising media; examination of algorithms, technologies, and software used in media planning. Prerequisite: COMM 320
COMM 424 ADVERTISING CAMPAIGNS (3) Advertising campaign problems from the viewpoint of the national advertiser and advertising agency; production of a complete advertising campaign. Prerequisite: COMM 420 or COMM 404, COMM 421W, COMM 422
COMM 425 ADVERTISING MESSAGE STRATEGY (3) Advanced work in developing message strategies for advertising campaigns; presentation and defense of strategic plans; extensive practice in creating advertisements. Prerequisite: COMM 421W, COMM 422
COMM 437 NARRATIVE VIDEO/FILMMAKING (3) Intensive exploration of narrative form through the production of a fiction film or video. Prerequisite: COMM 337
COMM 438 NON-FICTION VIDEO/FILMMAKING (3) Intensive exploration of documentary traditions through the production of a non-fiction video or film. Prerequisite: COMM 337, seventh-semester standing

COMM 439 ALTERNATIVE FILM/VIDEO PRODUCTION (3) Intensive exploration of non-narrative form through the production of a film or video. Prerequisite: COMM 337
COMM 440 ADVANCED PRODUCTION TECHNOLOGY AND TECHNIQUE (3) Intensive practical experience and studies of camera, lighting, audio, and editing. Prerequisite: COMM 345
COMM 445 DIRECTING FOR THE SCREEN II (3) An advanced course in directing for both narrative and documentary film and video. Prerequisite: COMM 345
COMM 446 WRITING FOR THE SCREEN II (3) An advanced course in screenwriting that further develops elements of storytelling technique. Prerequisite: COMM 346
COMM 447 FILM AND VIDEO ANIMATION (3) This is a production course designed to provide hands-on exploration of various animation techniques. Prerequisite: COMM 337
COMM 448 ADVANCED CINEMATOGRAPHY AND SOUND WORKSHOP (3) Intensive practical experience and studies of camerawork, lighting, and audio production. Prerequisite: COMM 342
COMM 449 ADVANCED FILM AND VIDEO PROJECTS (1–6) Applied theory/technique of synchronous sound film and video production; supervised experience in major production. Individual and group-directed study of in-depth projects. Prerequisite: COMM 437
COMM 450 ANALYSIS OF FILM PRACTICE (3) Course is oriented towards video and filmmakers; analyses of how ideas and creative concepts are connected to the production process. Prerequisite: COMM 242, COMM 250
COMM 451 TOPICS IN AMERICAN FILM (3 per semester, maximum of 6) Critical and historical studies of American films. Analysis of directing, cinematography, editing, screenwriting, and acting. Prerequisite: COMM 250
COMM 452 TOPICS IN INTERNATIONAL CINEMA (3 per semester, maximum of 6) Critical and historical studies of topics in non-American film. Analysis of theory, direction, cinematography, editing, and screenwriting. Prerequisite: COMM 250
COMM 453 (CMLIT) NARRATIVE THEORY: FILM AND LITERATURE (3) Comparative study of the aesthetics and techniques of film and literature; close analyses of masters of each art form. Prerequisite: COMM 150 or 3 credits in literature
COMM 454 DOCUMENTARY IN FILM AND TELEVISION (3 per semester, maximum of 6) Study of representative films from various documentary movements, examining form, technique, trends, and audience objectives. Prerequisite: fourth-semester standing
COMM 455 ADVANCED FILM THEORY AND CRITICISM (3 per semester, maximum of 6) Close examination of classic and contemporary film theory and critical perspectives. Prerequisite: COMM 250
COMM 460W REPORTING METHODS (3) Techniques in reporting news and trends at the local, regional, and county levels. Emphasis on both deadline and interpretive reporting. Prerequisite: COMM 260W
COMM 461 PROFESSIONAL JOURNALISM SEMINAR (3 per semester, maximum of 6) Problems of research, content, and form in journalistic specializations; topics of specialization announced each semester course is offered. Prerequisite: COMM 260W
COMM 462 THE FEATURE ARTICLE (3) Reporting and writing the human interest article for newspapers and magazines. Prerequisite: COMM 260W
COMM 464W EDITORIAL WRITING AND NEWS ANALYSIS (3) Introduces advanced journalism students to theory and techniques of writing news analyses, editorials, and reviews of culture and the arts. Prerequisite: COMM 260W
COMM 465 BROADCAST JOURNALISM II (3) Television news reporting and production. Prerequisite: COMM 360
COMM 466 PUBLIC AFFAIRS BROADCASTING (3) Producing radio and television magazine programs featuring individually- produced mini-documentaries and public affairs interviews. Prerequisite: COMM 383 OR COMM 465
COMM 467 NEWS EDITING AND EVALUATION (3) Concepts and procedures involved in processing news for various news media, but with emphasis on print media editing. Prerequisite: COMM 260W
COMM 468 GRAPHIC APPLICATIONS IN PRINT COMMUNICATIONS (3) Issues, concepts, and practice identified with contemporary design strategies for print journalism, advertising, and public relations. Prerequisite: COMM 260W or COMM 320
COMM 469 PHOTOGRAPHY FOR THE MASS MEDIA (3) Development of an informed and critical approach to photocommunication; individual and team projects, seminars, and critiques. Prerequisite: COMM 269
COMM 470A CONVERGENT MEDIA NEWS SERVICE: NEWSPAPER PRODUCTION (3) Practicum emphasizing newsgathering and reporting for newspaper and for additional media formats. Prerequisite: COMM 260W
COMM 470B CONVERGENT MEDIA NEWS SERVICE: TV (3) Practicum emphasizing television news package production for periodic campus news program and for additional media formats. Prerequisite: COMM 260W
COMM 470C CONVERGENT MEDIA NEWS SERVICE: STREAMING RADIO AND ONLINE PUBLICATIONS (3) Practicum emphasizing streaming radio news package production or production of news pieces for online publications and for additional media formats. Prerequisite: COMM 260W
COMM 471 PUBLIC RELATIONS MEDIA AND METHODS (3) Analyzing media and audiences for public relations purposes; planning, designing, and writing public relations communications; press relations and publicity methods. Prerequisite: COMM 260W and COMM 370

COMM 473 PUBLIC RELATIONS CAMPAIGNS (3) Case studies and problems in publicity and public relations in industry, government, and institutions. Prerequisite: COMM 370, COMM 420 or COMM 404, and COMM 471
COMM 474 DEPTH REPORTING (3) Exploration of strategies for developing indepth newspaper or magazine articles, with an emphasis on gathering information and long-form writing. Prerequisite: COMM 260W
COMM 475 ISSUES FOR NEWSROOM MANAGERS (3) Newspaper and television management, the state of the industry and topics that prospective employees should know about. Prerequisite: COMM 260W
COMM 479 TELECOMMUNICATION NETWORKS (3) Economic, regulatory/business issues in the design/operation of large-scale telecommunication networks such as telephone, cable, wireless, and computer networks. Prerequisite: COMM 180, and ECON 002 or ECON 014
COMM 480 THEORIES AND ISSUES IN MASS COMMUNICATIONS (3) Review and evaluation of contemporary theories used to explain the structure, uses, and effects of mass communications. Prerequisite: COMM 408 OR COMM 413
COMM 484 EMERGING TELECOMMUNICATIONS TECHNOLOGIES (3) Overview of technology of electronic media and related societal issues. Prerequisite: COMM 180
COMM 485 ANALYSIS OF BROADCAST-CABLE POLICY (3) Analysis of current policy issues in Broadcast/Cable. Standards and methods for evaluating telecomm policy processes and outcomes. Prerequisite: COMM 381 or COMM 483
COMM 487 TELECOMMUNICATION ADMINISTRATION (3) Operation/administration decision-making for broadcasting, broadband, telecommunications, and information firms including sales, marketing, programming, customer service, technology adoption, finance and capital investment. Prerequisite: COMM 387
COMM 489W MEDIA AND INFORMATION INDUSTRIES (3) The structure, conduct and performance of firms and industries in the electronic media and information sectors. Prerequisite: COMM 387 or equivalent
COMM 490 ISSUES IN ELECTRONIC COMMERCE: POLICY AND IMPLEMENTATION (3) Analysis of policy, strategic issues, and implications raised by the rapid growth of electronic commerce over the Internet. Prerequisite: COMM 180 for telecom major; permission of instructor for non-telecom majors
COMM 490A CONVERGENT MEDIA SEMINAR (3) This seminar examines media convergence issues, trends, and effects on society through discussions, presentations, and creation of a capstone project. Prerequisite: seventh- or eighth-semester standing and 3 credits of COMM 470A, COMM 470B, or COMM 470C
COMM 491 INTERNATIONAL TELECOMMUNICATIONS AND TRADE POLICY (3) Development in the law, policy, and business of international telecommunications; emphasis on multilateral forums—International Telecommunications Union and World Trade Organization. Prerequisite: COMM 180
COMM 492 INTERNET LAW AND POLICY (3) Development in the law, policy, and business of Internet-mediated communications and commerce; emphasis on impact on existing legal, regulatory, and economic models. Prerequisite: COMM 180
COMM 493 ENTREPRENEURSHIP IN THE INFORMATION AGE: SENIOR SEMINAR (3) Provides students with knowledge/tools to take their innovation/technology idea through the business planning, capital, and operations budgeting processes. Prerequisite: COMM 387
COMM 494 RESEARCH PROJECT COURSES (1–12)
COMM 495 INTERNSHIP (1–3) Supervised summer practicum with newspapers, broadcasting stations, public relations, and advertising agencies. Prerequisite: continuing student majors in the School of Communications; departmental approval
COMM 496 INDEPENDENT STUDIES (1–18)
COMM 497 SPECIAL TOPICS (1–9)
COMM 498 SPECIAL TOPICS (1–9)
COMM 499 (GI) FOREIGN STUDY—MASS COMMUNICATIONS (1–12) Study of mass communication systems and practices in selected foreign countries. Prerequisite: departmental approval

COMMUNICATIONS (COMMS)

Capital College

COMMS 221 BASIC PHOTOGRAPHY (3) An introduction to photography, emphasizing both technical skills and aesthetics with both the camera and in the darkroom.
COMMS 225 GRAPHIC DESIGN (3) Introduction to basic design principles, critical analysis of visual material, and solving graphics problems utilizing traditional and digital production tools.
COMMS 230W WRITING FOR MEDIA (3) The application of creativity to the practical concerns of narrative script and radio/television spot writing. Prerequisite: ENGL 015 and ENGL 202
COMMS 231W JOURNALISTIC WRITING (3) The analysis and practice of news, feature, and editorial writing for print, radio, and television. Prerequisite: ENGL 015 and ENGL 202
COMMS 251 THE NATURE OF MEDIA (3) A theoretical, cultural, and philosophical study of print and nonprint media, including their histories, possibilities, limitations, and interrelationships.
COMMS 325 DESKTOP PUBLISHING (3) Practical and theoretical approach to visual communication production in newspaper journalism, advertising, public relations, and other communication industries. Prerequisite: COMMS 221 or COMMS 225
COMMS 332 REPORTING (3) Practice in researching and gathering material for and preparation of news stories for print media. Prerequisite: COMMS 231W

COMMS 350 (GI) COMPARATIVE MEDIA CULTURES (3) Intercultural examination of economic, political, philosophical, and historical forces that shape various societies' newsgathering routines and content. Prerequisite: COMMS 251
COMMS 352 FILM AND CULTURAL VALUES (3) Study of cinematic techniques and the evolution of the grammar of the film medium in different cultural contexts. Prerequisite: COMMS 251
COMMS 371 VISUAL AND VIDEO COMMUNICATION (4) A study of the technical and aesthetic factors in visual production, including visualization, composition, lighting, sound, performance, and project management. Prerequisite: COMMS 251
COMMS 374 AUDIO COMMUNICATION (3) Theory and practice in studio recording and broadcasting techniques, including continuity/news writing, control room operation and audio production. Prerequisite: COMMS 251
COMMS 410 MASS MEDIA AND POLITICS (3) Study of mass media as institutions and the effects of the mass media on politics, public policy, and citizens. Prerequisite: COMMS 251
COMMS 416 MEDIA MANAGEMENT (3) Theoretical bases and practical approaches for management and administration of communications projects, organizations, and resources. Prerequisite: COMMS 251
COMMS 421 ADVANCED PHOTOGRAPHY (3) Advanced applications in documentary photography emphasizing the narrative qualities of imagery, and utilizing digital technologies. Prerequisite: COMMS 221 or permission of the program
COMMS 425 ADVANCED GRAPHIC DESIGN (3) Theory and practice designing graphic visual communication in commercial, non–commercial, and fine art formats for print and on-line media. Prerequisite: COMMS 225 and COMMS 371
COMMS 433 FEATURE WRITING (3) The study and practice of feature writing for newspapers and magazines. Prerequisite: COMMS 230W or COMMS 231W
COMMS 435 ADVANCED REPORTING (3) Advanced study of the tools, techniques, and responsibilities of public affairs reporting with special emphases on writing and research. Prerequisite: COMMS 332
COMMS 437 WRITING FOR THE PERFORMER (3) Practical seminar in writing for the screen and stage. Prerequisite: COMMS 230W or COMMS 231W or permission of program
COMMS 438 MAGAZINE EDITING (3) Study and practice of the editing and design of magazines and newsletters. Prerequisite: COMMS 231W
COMMS 446 (THTRE) PERFORMANCE STUDIES (3) Study of and experimentation with a selected concept of theatre, such as children's theatre, foreign language plays, or presentational theatre. Prerequisite: COMMS 251
COMMS 451 MEDIA-AUDIENCES AND CONTEXTS (3) Survey of the ways media attempt to influence audience reception and how audiences hold sway over media content. Prerequisite: COMMS 251
COMMS 453 MEDIA CRITICISM AND THEORY (3) Critical and theoretical approaches to the analysis of media and communication. Prerequisite: COMMS 371
COMMS 454 MEDIA LAW AND ETHICS (3) The study and practice of key issues in media law and ethics, including libel law, conflict of interest, truth in advertising. Prerequisite: COMMS 251
COMMS 456 DRAMA AS COMMUNICATION (3) Seminar on the interrelationship between dramatic form, myth, ritual, and technology in Western culture. Prerequisite: COMMS 251 or COMMS 446
COMMS 459 CULTURAL EFFECTS OF INTERACTIVE AND ONLINE MEDIA (3) Study of the global social impact and rhetorical limitations of converging media, emphasizing cross-cultural media influences. Prerequisite: COMMS 251
COMMS 460 PUBLIC RELATIONS AND INFORMATION (3) Study of the techniques, methods, and skills required of a public relations specialist. Prerequisite: COMMS 230W or COMMS 231W
COMMS 462 ADVERTISING AS COMMUNICATION (3) Study of verbal and graphic communications skills employed in advertising, including copywriting, concept development, layout, and graphic design for various media. Prerequisite: COMMS 230W or COMMS 231W and COMMS 225
COMMS 480 STUDIES IN MEDIA (3 per semester) Advanced study of a specialized scholarly or creative aspect of communication, e.g., advertising, aesthetics, cinematography, videography, audience research, etc.; may be repeated for credit as topics change. Prerequisite: COMMS 251
COMMS 483 ADVANCED COMMUNICATION WORKSHOP (4) Conceptualization, planning, and execution of a visual product on a selected topic utilizing an intensive group project-oriented laboratory approach. Prerequisite: COMMS 251 and COMMS 371
COMMS 491 WRITERS' SEMINAR (3 per semester) Workshop designed for advanced students interested in professional writing, involving extensive mutual and self-criticism. Prerequisite: COMMS 230W or COMMS 231W

COMMUNITY AND ECONOMIC DEVELOPMENT (CEDEV)

College of Agricultural Sciences

CEDEV 417 (R SOC) POWER, CONFLICT, AND COMMUNITY DECISION MAKING (3) Theory and analysis of power, conflict and decision making, and community crisis. Community change illustrations will be used. Prerequisite: R SOC 011 or SOC 001
CEDEV 420 (GI) (R SOC;WMNST) WOMEN IN DEVELOPING COUNTRIES (3) Analysis of women's work, experiences, and development policies and practices in Africa, Asia, and Latin America.

CEDEV 430 (AG EC) PRINCIPLES OF COMMUNITY ECONOMIC DEVELOPMENT (3) Concepts, strategies, and techniques of local economic analysis, planning, and development; case studies and decision-making exercises. Prerequisite: introductory course in economics
CEDEV 432 (AG EC) TECHNIQUES OF COMMUNITY ECONOMIC DEVELOPMENT PLANNING (3) Techniques of financial and organizational analysis applied to actual community economic development problems; utilization of innovate economic development strategies and methods. Prerequisite: AG EC 430
CEDEV 452 (R SOC) RURAL ORGANIZATION (3) Social organization and change in rural communities; use of sociological principles in analysis of rural problems and rural development. Prerequisite: 6 credits in rural sociology, sociology, or psychology
CEDEV 460 (R SOC) INTRODUCTION TO COMMUNITY INFORMATION SYSTEMS (3) Introduction to community information systems; information needs; common features; issues in development; organization vs. community-wide systems; current technologies. Prerequisite: 6 credits in quantification; 6 credits in social or behavioral science
CEDEV 462 (R SOC) COMMUNITY INFORMATION SYSTEMS LABORATORY (3) Laboratory for development of a model community information system. Prerequisite: R SOC 460
CEDEV 470 (R SOC) COMPARATIVE COMMUNITY DEVELOPMENT (3) Crosscultural community development projects and the problems encountered in each of the different cultural contexts. Prerequisite: 6 credits in social or behavioral science

COMMUNITY STUDIES (COM S)

College of Health and Human Development
COM S 445 (ADM J) CRIMINAL JUSTICE AND THE COMMUNITY (3) Justice agencies and the community's crime prevention and participation strategies; community involvement in policy development. Prerequisite: ADM J 111 , ADM J 221

COMPARATIVE AND INTERNATIONAL EDUCATION (CI ED)

College of Education
CI ED 470 (ADTED) INTRODUCTION TO DISTANCE EDUCATION (3) An introduction to the history, theory, organization, technologies, and instructional procedures used in American and foreign distance education.
CI ED 497 SPECIAL TOPICS (1–9)

COMPARATIVE LITERATURE (CMLIT)

College of the Liberal Arts
CMLIT 001 (GH) INTRODUCTION TO WESTERN LITERATURES THROUGH THE RENAISSANCE (3) Introductory comparative survey of European and American literatures of Ancient through Renaissance periods, considering genre, themes, cultural and literary values.
CMLIT 002 (GH;GI) INTRODUCTION TO WESTERN LITERATURES SINCE THE RENAISSANCE (3) Introductory comparative survey of European and American literatures, post-Renaissance through Modern, considering genre, themes, cultural and literary values.
CMLIT 003 (GH;GI) INTRODUCTION TO AFRICAN LITERATURES (3) Comparative analysis of drama, essay, novel, poetry and stories, from traditional oral forms to contemporary expressions of African literary styles.
CMLIT 004 (GH;GI) INTRODUCTION TO ASIAN LITERATURES (3) Comparative intepretations of narrative, drama, lyric, and other writings from East Asia and other regions, viewed as world literature.
CMLIT 005 (GH;GI) INTRODUCTION TO LITERATURES OF THE AMERICAS (3) Comparative interpretation of the oral and written literary traditions of North, Central, and South America.
CMLIT 006 (GH) (PHIL) PHILOSOPHY AND LITERATURE IN WESTERN CULTURE (3) Explores fundamental issues of human existence through the traditions of western literature and philosophy.
CMLIT 010 (GH;GI) THE FORMS OF WORLD LITERATURE: A GLOBAL PERSPECTIVE (3) The development of literature around the world—from epic, legend, lyric, etc. in the oral tradition to modern written forms.
CMLIT 010S (GH;GI) THE FORMS OF WORLD LITERATURE: A GLOBAL PERSPECTIVE (3) The development of literature around the world—from epic, legend, lyric, etc. in the oral tradition to modern written forms.
CMLIT 011 (GH;GI) THE HERO IN WORLD LITERATURE (3) The figure of the hero/heroine examined in world literature as a vehicle for expressing social and cultural values.
CMLIT 083S (GH;GI) FIRST-YEAR SEMINAR IN COMPARATIVE LITERATURE (3) International topics in literature and culture; each seminar will have a specific topic as announced (see the Comparative Literature Web site).
CMLIT 097 SPECIAL TOPICS (1–9)
CMLIT 099 (GI) FOREIGN STUDIES (1–12)
CMLIT 100 (GH;GI) INTRODUCTION TO COMPARATIVE LITERATURE (3) Comparative approaches (studying international literary periods, themes, genres, etc.) and principles of literary interpretation introduced through readings representing various cultures.

CMLIT 101 (GH;GI) THE THEME OF IDENTITY IN WORLD LITERATURE: RACE, GENDER, AND OTHER ISSUES OF DIVERSITY (3) Themes of gender and heritage, centrality and marginality, self and other, as expressed in literary works from around the world.
CMLIT 105 (GH;GI) THE DEVELOPMENT OF LITERARY HUMOR (3) Literary humor expressed as satire, comedy, and farce—from ancient times to the present—in an international and multicultural context.
CMLIT 106 (GH;GI) THE ARTHURIAN LEGEND (3) The growth and development of the legend of King Arthur, from medieval Europe to modern Japan.
CMLIT 107 (GH;GI) THE LITERATURE OF EXPLORATION: EXTRAORDINARY VOYAGES FROM ANTIQUITY TO THE FUT URE (3) An international selection of journey narratives, from the real to the imaginary; travel narratives as critiques of self and society.
CMLIT 108 (GH;GI) MYTHS AND MYTHOLOGIES (3) World mythology: myths primarily of non-Western cultures, based on selected areas and traditions around the world.
CMLIT 109 (GH;GI) NATIVE AMERICAN MYTHS, LEGENDS, AND LITERATURES (3) Myths, legends, and literatures of Native American cultures.
CMLIT 110 (GH;GI) JEWISH LITERATURE: AN INTERNATIONAL PERSPECTIVE (3) Literature of the Jewish tradition in various cultures and contexts, such as Europe, Israel, Islamic countries, and the Americas.
CMLIT 111 (GH;GI) INTRODUCTION TO LITERATURES OF INDIA (3) Narrative, lyric, religious, oral, and dramatic literature, as well as film, from India studied in translation from a global perspective.
CMLIT 120 (GH) THE LITERATURE OF THE OCCULT (3) Important literary works dealing with witchcraft, demonology, vampirism, ghosts, and related concepts, from biblical times to present.
CMLIT 141 (GH;GI) RELIGION AND LITERATURE (3) Major religious themes as expressed in literary masterpieces; sacred texts from various cultures read as literature.
CMLIT 153 (GH;GI) INTERNATIONAL CULTURES THROUGH LITERATURE AND FILM (3) Comparison of narrative techniques employed by literature and film in portraying different cultures; topics may vary each semester.
CMLIT 184 (GH) (ENGL) THE SHORT STORY (3) Lectures, discussion, readings in translation, with primary emphasis on major writers of the Nineteenth and Twentieth Century.
CMLIT 185 (GH) (ENGL) THE MODERN NOVEL IN WORLD LITERATURE (3) Development of the modern novel in the last century (outside the British Isles and the United States); lectures, discussions, readings in translation.
CMLIT 187 COMPARATIVE LITERATURE FRESHMAN SEMINAR (3) The meaning and advantages of a Liberal Arts education in context of a specific discipline. Prerequisite: first-semester standing and enrollment in the College of the Liberal Arts
CMLIT 189 (GH) (ENGL) THE FOUNDERS OF MODERN DRAMA (3) Playwrights who set the world's stage for twentieth-century drama; issues that continue to shape the contemporary theatrical world.
CMLIT 197 SPECIAL TOPICS (1–9)
CMLIT 199 (GI) FOREIGN STUDY—COMPARATIVE LITERATURE (3–6) Course offered on comparative literary topics as part of a foreign-study program.
CMLIT 294 RESEARCH PROJECT (1–12)
CMLIT 295 INTERNSHIP (1–18) Supervised off-campus, non-group instruction including field experiences, practica, or internships. Written and oral critique of activity required.
CMLIT 296 INDEPENDENT STUDIES (1–18)
CMLIT 297 SPECIAL TOPICS (1–9)
CMLIT 298 SPECIAL TOPICS (1–9)
CMLIT 299 (GI) FOREIGN STUDIES (1–12)
CMLIT 300H HONORS THESIS (3) Individual projects involving research, reading, and writing; preparation of an honors thesis in comparative literature or world literature. Prerequisite: Participation in the University Scholars program
CMLIT 395 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
CMLIT 399 (GI) FOREIGN STUDY—COMPARATIVE LITERATURE (3–6) Special course offered on comparative literary topics as part of a foreign- study program. Prerequisite: third-semester standing
CMLIT 400W SENIOR SEMINAR IN LITERARY CRITICISM AND THEORY (3) Discussions of theories of literature, of literary criticism, and particularly of the distinct methods of comparative study; individual projects. Prerequisite: seventh-semester standing; 18 credits in literature
CMLIT 401W THE WESTERN LITERARY HERITAGE I (3) Major literary movements and authors in the literature of the Western world from the beginnings through the early Renaissance. Prerequisite: 3 credits in literature or history
CMLIT 402W THE WESTERN LITERARY HERITAGE II (3) Major literary movements and authors in the literature of the Western world from the late Renaissance to the present time. Prerequisite: 3 credits in literature or history
CMLIT 404 LITERARY MODES OF ASIA (3) Selected works from the major poetry, fiction, and drama of such countries as India, China, Japan. Prerequisite: 3 credits in literature or related field appropriate to this course
CMLIT 405 INTER-AMERICAN LITERATURE (3) This course examines the development of literature in Canada, the United States, Spanish America, the Caribbean area, and Brazil. Prerequisite: 3 credits in literature

CMLIT 406 WOMEN AND WORLD LITERATURE (3) Literature written by women, especially women from non-Western cultures; the spectrum of genres in which women writers have excelled. Prerequisite: 3 credits in literature or in women's studies
CMLIT 408 HEROIC LITERATURE (3) Traditional heroes, their traits and adventures; typical themes and examples chosen from the epics and sagas of world literature. Prerequisite: 3 credits in literature or folklore
CMLIT 410 PROBLEMS IN TRANSLATION (3) Emphasizing literary translation, a study of the theoretical and practical problems encountered in the processes of translation, transmission, and interpretation. Prerequisite: 18 Credits in a foreign language
CMLIT 422 AFRICAN DRAMA (3) Traditional and popular drama forms; modern anglophone and francophone drama; nationalism and social criticism in contemporary African drama.
CMLIT 423 AFRICAN NOVEL (3) From traditional oral narratives to modern autobiograhical, historical, satirical, sociological, and allegorical forms; novelist as social critic.
CMLIT 443 LITERARY RELATIONS OF GERMANY WITH ENGLAND AND AMERICA (3–9) Nature and extent of the literary relations of Germany and England; in alternate years, of Germany and America. A reading knowledge of German is recommended but not required. Conducted in English.
CMLIT 453 (COMM) NARRATIVE THEORY: FILM AND LITERATURE (3) Comparative study of the aesthetics and techniques of film and literature; close analyses of masters of each art form. Prerequisite: COMM 150 or 3 credits in literature
CMLIT 470 OLD MASTERS OF THE MODERN NOVEL (3) Major novels of Joyce, Proust, Kafka, Thomas Mann, Nabokov, and others; their contributions to the art of the novel. Prerequisite: 3 credits in literature
CMLIT 480 THE INTERNATIONAL FOLKTALE (3) Traditional tales from various parts of the world: their origin, characteristics, forms; their transmission as oral narrative and written literature. Prerequisite: 3 credits in literature or folklore
CMLIT 481 THEORY AND TECHNIQUES OF WORLD FOLKLORE (3) Provides essential backgrounds to major folklore approaches and gives direction to the application of the most popular analytic methods. Prerequisite: 3 credits in literature
CMLIT 486 TRAGEDY (3) Development of tragic drama and its relationship to social background and philosophical theory.
CMLIT 487 COMEDY (3) Development of comic drama and its relationship to social background and philosophical theory.
CMLIT 488 (ENGL) MODERN CONTINENTAL DRAMA (3) From Ibsen to the drama of today: Strindberg, Chekhov, Hauptmann, Pirandello, Ionesco, Beckett, Genet, and others. Prerequisite: ENGL 015 or ENGL 030
CMLIT 494 RESEARCH PROJECT (1–12)
CMLIT 496 INDEPENDENT STUDIES (1–18)
CMLIT 497 SPECIAL TOPICS (1–9)
CMLIT 498 SPECIAL TOPICS (1–9)
CMLIT 499 (GI) FOREIGN STUDY—COMPARATIVE LITERATURE (3–6) Advanced courses offered on comparative literary topics as part of a foreign- study program. Prerequisite: 18 credits or equivalent in the appropriate foreign language; 6 credits in literature or related field appropriate to this course

COMPUTER ENGINEERING (CENBD)

Penn State Erie, The Behrend College
CENBD 295 INTERNSHIP (1–18)
CENBD 296 INDEPENDENT STUDIES (1–18)
CENBD 297 SPECIAL TOPICS (1–9)
CENBD 360 (CMPBD) OBJECT-ORIENTED SOFTWARE DESIGN AND CONSTRUCTION (3) Design, documentation, testing, and construction of software using software engineering strategies embodied in object-oriented programming languages. Prerequisite: CMPBD 205 or CSE 120
CENBD 421 (EE BD) MICROPROCESSORS (3) Microprocessor architecture; memory system design; assembly language programming; interrupts; the stacks and subroutines; memory and I/O inter- facing; serial I/O and data communications; microprocessors applications. Prerequisite: EE BD 325
CENBD 429 COMPUTER VISION (3) Image formation, segmentation, filtering, edge detection, texture analysis, shape from shading, color, stereo matching, and dynamic scene analysis. Prerequisite: CMPSC 201C or CMPSC 201F; EE BD 326
CENBD 431 VLSI DESIGN (3) Basic building blocks of CMOS design, design rules, chip planning, layout design, system power and timing, simulation of VLSI structures. Prerequisite: CSE 271 or EE BD 325; CSE 275, EE BD 324
CENBD 451W EMBEDDED SYSTEMS DESIGN (3) Design/development of embedded systems for data acquisition, process control, and special-purpose computing systems; peripheral interfacing, serial/parallel communications and bus systems. Prerequisite: EE BD 421
CENBD 452 ADVANCED DIGITAL DESIGN (3) Theory, design, and implementation of digital circuits based on combinational and sequential circuits; implementation of designs using hardware description language. Prerequisite: CSE 271, CSE 275: CSE 103 or CMPSC 201C or CMPSC 201F
CENBD 453 COMPUTER ARCHITECTURE (3) Introduction to computer architecture. Memory hierarchy and design, CPU design, pipelining, multiprocessor architecture. Prerequisite: EE BD 421, CENBD 452

CENBD 455 DATA COMMUNICATIONS (3) Data transmission, encoding, link control techniques, network architecture, design, protocols, and multiple access. Prerequisite: CSE 271 or EE BD 325; CSE 275, EE BD 326
CENBD 461 SOFTWARE ENGINEERING (3) Software engineering principles including life cycle, dependability, process modeling, project management, requires specification, design analysis, implementation, testing, and maintenance. Prerequisite: CSE 120 Concurrent: CENBD 360
CENBD 462 SOFTWARE VERIFICATION, VALIDATION, AND TESTING (3) Introduction to methods of software verification, validation, and testing; mathematical foundations of testing, reliability models; statistical testing. Prerequisite: CENBD 360, CENBD 461, STABD 303
CENBD 463 OPERATING SYSTEMS (3) Resource management in computer systems. Process scheduling, memory management, file system design, I/O management, Unix operating system. Prerequisite: CSE 260
CENBD 465 COMPILER CONSTRUCTION (3) Design and implementation of compilers, lexical analysis, syntax/semantic analysis, optimization, and code generation. Prerequisite: CMPBD 410
CENBD 467 CONCURRENT SOFTWARE DESIGN (3) Problems of synchronization, concurrent execution, and their solution techniques. Design and implementation of concurrent software in a distributed system. Prerequisite: CMPBD 410
CENBD 480 ENGINEERING DESIGN CONCEPTS (3) Engineering design and modeling, engineering economy, project planning, capstone project selections, and technical communication skills. Prerequisite: CENBD 451W, CENBD 453, seventh-semester standing
CENBD 481 COMPUTER DESIGN PROJECTS (3) Group or individual design projects in the area of computer engineering. Prerequisite: EE BD 480, eighth-semester standing
CENBD 482 SENIOR SOFTWARE ENGINEERING SEMINAR (1) Concepts of engineering ethics, economy, and project management, senior capstone project selection, and technical communication skills. Prerequisite: CENBD 462
CENBD 483 SOFTWARE DESIGN PROJECTS (3) Capstone group design projects in software engineering. Prerequisite: CENBD 482
CENBD 494 RESEARCH PROJECT (1–12)
CENBD 495 INTERNSHIP (1–18)
CENBD 496 INDEPENDENT STUDIES (1–18)
CENBD 497 SPECIAL TOPICS (1–9)

COMPUTER ENGINEERING (CMPEH)

Capital College
CMPEH 301 INTRODUCTION TO MICROCOMPUTERS (2) Basic microcomputer architecture, application, programs, and interfacing. Prerequisite: CMPSC 201, junior standing
CMPEH 449 VLSI DIGITAL CIRCUITS (3) Modern approaches to using VLSI technology; logic circuits, cell layout and design on CAD systems. Prerequisite: E ENG 370
CMPEH 472 MICROPROCESSORS (3) Principles of microprocessors, hardware architecture, assembly language, programming, interfacing, and applications of microprocessors will be studied. Prerequisite: CSE 271, CSE 275, E ENG 368

COMPUTER ENGINEERING TECHNOLOGY (CMPET)

Capital College
CMPET 197 SPECIAL TOPICS (1–9)
CMPET 240 MICROPROCESSOR INTERFACING (5) Examination of the devices used in microprocessor systems to communicate with external digital and analog systems. Prerequisite: EE T 210, EE T 211
CMPET 241 ADVANCED MICROPROCESSOR SYSTEMS (4) Development of an understanding of microprocessor principles and systems through a study of current 8- and 16-bit microprocessors. Prerequisite: EE T 211
CMPET 242 MICROPROCESSOR SYSTEMS DESIGN AND ANALYSIS (3) Experience in designing, constructing, and testing a complete microcomputer system and its practical application to control. Prerequisite: EE T 211
CMPET 297 SPECIAL TOPICS (1–9)
CMPET 298 SPECIAL TOPICS (1–9)
CMPET 300 INTRODUCTION TO COMPUTER HARDWARE AND SOFTWARE (1) This course is an introduction to the computer facilities and software available at Penn State Harrisburg. Prerequisite: a structured 3 credit course in Fortran, Pascal, or C
CMPET 400 COMPUTER ARCHITECTURE, ORGANIZATION, AND DESIGN (4) Instruction sets, formating, sequencing, and addressing modes; central processing unit design; computer peripheral, I/O, memory organization, and computer communications. Prerequisite: E E T 403
CMPET 401 DATA COMMUNICATION AND NETWORKING (3) Signal representations, communication techniques, interfacing, serial and parallel communication, modems, error detection, LAN and WAN protocols. Prerequisite: CMPET 400
CMPET 402 DATA COMMUNICATION AND NETWORKING LABORATORY (1) Network operating systems, LAN and WAN protocols, serial and parallel communications, modems, FAX, and other interfacing methods. Prerequisite: or concurrent: CMPET 401

COMPUTER INFORMATION SYSTEMS (CINSY)

Capital College

CINSY 311 INTRODUCTION TO COMPUTING CONCEPTS (3) Computing concepts for information processing and computer technologies associated with information management; microcomputer applications, programming in modern language support concepts.

CINSY 406 MICROCOMPUTER TECHNOLOGY AND APPLICATION (3) Introduction to fundamental components of microcomputer technologies and applications. Prerequisite: CINSY 311

CINSY 408 INTRODUCTION TO OBJECT-ORIENTED PROGRAMMING AND DESIGN (3) An introduction to object-oriented design and program development; application of concepts will occur using a programming language. Prerequisite: CINSY 311

CINSY 410 HYPERTEXT MARKUP LANGUAGE (3) The study of WEB applications using HTML; course will cover basic design and applications for the WEB. Prerequisite: CINSY 311

CINSY 411 TOPICS IN COMPUTER INFORMATION SYSTEMS (3) Covers new trends and concepts in information/processing technology and their applications and impact on computer information systems. Prerequisite: permission of program coordinator

CINSY 421 MULTIMEDIA TECHNOLOGIES (3) Introduces multimedia technologies and concepts; various applications of multimedia technologies will be introduced Prerequisite: CINSY 311

CINSY 425 GRAPHICAL INTERFACE DESIGN AND APPLICATIONS (3) Study of interface design with special emphasis on design for information system applications; application concepts will occur using programming language. Prerequisite: CINSY 311

CINSY 427 WEB PROGRAMMING (3) Introduction to WEB design, programming, applications, and techniques for WEB development. Prerequisite: CINSY 311, CINSY 410

CINSY 431 BUSINESS PROGRAMMING WITH COBOL (3) Introduction to the syntax and grammer of COBOL language with emphasis on applications to business data processing. Prerequisite: CINSY 311

CINSY 436 FILE MANAGEMENT AND COBOL (3) Creation and maintenance of sequential and direct access files, report writing and other advanced programming techniques. Prerequisite: CINSY 431

CINSY 441 DATA COMMUNICATIONS (3) Introduces data communications concepts, evolution, and applications. Computer networking methods and their components will be covered in this course. Prerequisite: CINSY 431 or permission of program coordinator

CINSY 446 DATABASE MANAGEMENT (3) Designed to provide students with explanation, comparison of techniques, methodology of systems, limitations, application of various database management systems. Prerequisite: CINSY 408, CINSY 431, or 3 credits in programming

CINSY 451 APPLIED SOFTWARE PROJECT (3) A project in the design, specification, and programming of a system in an application area. Prerequisite: permission of program coordinator

CINSY 497 SPECIAL TOPICS (1–9 per semester)

COMPUTER SCIENCE (CMPBD)

Penn State Erie, The Behrend College

CMPBD 097 SPECIAL TOPICS (1–9)

CMPBD 100 INTRODUCTION TO COMPUTERS WITH APPLICATIONS (1) Introduction to computer applications including word processing, spread–sheets, presentation graphics, e-mail, WWW and file system browsers, web page composers.

CMPBD 127 INTERMEDIATE PROGRAMMING LABORATORY (1) Weekly hands-on-laboratory experience to supplement CSE 120. Concurrent: CSE 120

CMPBD 197 SPECIAL TOPICS (1–9)

CMPBD 204 PROGRAMMING TECHNIQUES FOR BUS (4) Problem solving in M I S environment; high-level language programming; control structures, functions, parameters, recursion, arrays, records/structures; verification; debugging; documentation.

CMPBD 205 INTERMEDIATE PROGRAMMING TECHNIQUES FOR BUSINESS (3) Disciplined programming; abstract data types; documentation; program testing and verification; use of productivity tools. Prerequisite: CMPBD 204 , CMPSC 201C , CMPSC 201F , or CSE 103

CMPBD 210 SYSTEM HARDWARE AND SOFTWARE (3) Computer systems, system hardware/software concepts and technologies, procurement, and operational/administrative issues. Prerequisite: CMPBD 204 or CMPSC 201 or CSE 103

CMPBD 217 INTRODUCTION TO COBOL (3) Study of the COBOL programming language and its applications in industry.

CMPBD 296 INDEPENDENT STUDIES (1–18)

CMPBD 297 SPECIAL TOPICS (1–9)

CMPBD 350 FUNDAMENTALS OF COMMUNICATION NETWORKS (3) Introduction to the composition of communciation networks, including trans–mission mediums and protocols, transfer methods, topologies and software, and communications hardware. Prerequisite: 6 CREDITS OF CMPBD, CMPSC, AND/OR MIS COURSES

CMPBD 360 (CENBD) OBJECT-ORIENTED SOFTWARE DESIGN AND CONSTRUCTION (3) Design, documentation, testing, and construction of software using software engineering strategies embodied in object-oriented programming languages. Prerequisite: CMPBD 205 or CSE 120
CMPBD 397 SPECIAL TOPICS (1–9)
CMPBD 401 ADVANCED COBOL (3) Introduction to advanced COBOL features, file structures, and programming techniques and information processing. Prerequisite: CMPBD 217 or CMPSC 140
CMPBD 410 DATA STRUCTURES AND ALGORITHMS (3) Advanced data structures; design and analysis of algorithms. Prerequisite: CSE 260
CMPBD 411 SYSTEMS SOFTWARE ARCHITECTURE (3) History and implementation of computer system components. Translators, languages, loaders, memory, file structures, operating systems, peripherals. Prerequisite: CMPBD 210
CMPBD 423 (MTHBD) INTRODUCTION TO NUMERICAL ANALYSIS I (3) Floating point computation, numerical rootfinding, interpolation, numerical quadrature, direct methods for linear systems. Students may take only one course for credit from MATH 451 and MTHBD 423. Prerequisite: MATH 220 , MATH 230 , OR MATH 231; AT LEAST 3 CREDITS IN COMPUTER SCIENCE
CMPBD 424 (MTHBD) INTRODUCTION TO NUMERICAL ANALYSIS II (3) Polynomials and piecewise polynomial approximation; matrix least square problems; numerical solution of eigenvalue problems; numerical solutions of ordinary differential equations. Prerequisite: CMPSC 455 OR CMPBD 423
CMPBD 440 FUNDAMENTALS OF PROGRAMMING LANGUAGES (3) Fundamental principles of computer language design, stressing the relationship between design and implementation. In-depth study of a few representative languages. Prerequisite: CSE 260
CMPBD 450 NETWORK OPERATIONS AND MANAGEMENT (3) Study of local area network (LAN) and wide area network (WAN) topologies, operations, and management. Prerequisite: CMPBD 350
CMPBD 460W SCIENTIFIC VISUALIZATION PROJECTS (3) Principles of computer graphics and their application to visualization techniques. Prerequisite: CMPBD 360 , ENGL 202C
CMPBD 495 INTERNSHIP (1–18)
CMPBD 496 INDEPENDENT STUDIES (1–18)
CMPBD 497 SPECIAL TOPICS (1–9)

COMPUTER SCIENCE (CMPSC)

College of Engineering

CMPSC 001 BASIC COMPUTER PROGRAMMING (1) Fundamental characteristics of digital computers; organization and coding of problems for solution on digital computer. Prerequisite: 2 entrance units in mathematics
CMPSC 100 COMPUTER FUNDAMENTALS AND APPLICATIONS (3) Introduction to computer fundamentals and applications to data processing environments. Prerequisite: 2 entrance units in mathematics
CMPSC 101 (GQ) INTRODUCTION TO ALGORITHMIC PROCESSES (3) Properties of algorithms, languages, and notations for describing algorithms, applications of a procedure-oriented language to problem solving. A student may receive credit for only one of the following courses: CMPSC 101, 201C, 201F, CSE 103. Prerequisite: 2 entrance units in mathematics
CMPSC 101B INTRODUCTION TO ALGORITHMIC PROCESSES FOR THE BIOLOGICAL SCIENCES (3) Properties of algorithms, languages, and notations for describing algorithms, applications of a procedure-oriented language in the biological and life sciences. A student may receive credit for only one of the following courses: CMPSC 101, 101B, 103, 201, 203. Prerequisite: 2 entrance units in mathematics
CMPSC 102 COMPUTER ORGANIZATION AND PROGRAMMING (3) Computer components and organization, representation of numbers and characters, instruction codes, machine language, programming, assembly systems, input-output, subroutines, and macros. Prerequisite: CMPSC 101
CMPSC 110 COMPUTER PROGRAMMING FOR ENGINEERING TECHNICIANS (3) Introduction to computer programming including programming, structured language; microcomputer programming in basic; and spreadsheets. Intended for engineering technology students. Prerequisite: high school algebra
CMPSC 140 INTRODUCTION TO DATA PROCESSING (3) Applications of digital computers to problems in data processing with examples from accounting, record updating, inventory control, and report generation. Prerequisite: CMPSC 101
CMPSC 142 PROGRAMMING SYSTEMS FOR SMALL BUSINESS (3) Business applications programming and systems design applicable to the small business environment. Prerequisite: CMPSC 140
CMPSC 144 DATA ORGANIZATION AND ACCESSING TECHNIQUES (4) Design characteristics of external storage devices; record organizations; accessing considerations for sequential, direct, relative, and indexed files; internal data structures. Prerequisite: CMPSC 102, CMPSC 140
CMPSC 154 ADVANCED ASSEMBLER, I/O TECHNIQUES, AND JOB CONTROL LANGUAGES (3) Macro-expansion; assembler-level I/O control; COBOL-assembler linkage conventions; advanced debugging techniques; assembler design; op-system features and JCL techniques. Prerequisite: CMPSC 144
CMPSC 164 CONTEMPORARY TRENDS IN COMPUTER PROGRAMMING (3) State of the technology in design, code, test, and documentation techniques for information-processing systems and large EDP production programs. Students may not take both CMPSC 164 and 444 for credit. Prerequisite: CMPSC 154
CMPSC 174 ANALYSIS AND DESIGN OF INFORMATION SYSTEMS (2) The organization, flow charting, programming, debugging, and documentation of a major applied problem in a field of computer application. Prerequisite: third-semester standing

CMPSC 175 IMPLEMENTATION OF INFORMATION SYSTEMS (1) Implementation and evaluation of an information system as designed in CMPSC 174 with peer review of the design. Prerequisite: CMPSC 174
CMPSC 199 (GI) FOREIGN STUDIES (1–12)
CMPSC 201C (GQ) COMPUTER PROGRAMMING FOR ENGINEERS USING C (3) Development and implementation of algorithms in a procedure-oriented language, with emphasis on numerical methods for engineering problems. Students who have passed CMPSC 101, 201F, or CSE 103 may not schedule this course. Prerequisite: MATH 140 Concurrent: MATH 141
CMPSC 201F (GQ) COMPUTER PROGRAMMING FOR ENGINEERS USING FORTRAN (3) Development and implementation of algorithms in a procedure-oriented language, with emphasis on numerical methods for engineering problems. Students who have passed CMPSC 101, 201C, or CSE 103 may not schedule this course. Prerequisite: MATH 140 Concurrent: MATH 141
CMPSC 203 (GQ) PRINCIPLES OF PROGRAMMING WITH BUSINESS APPLICATIONS (4) Programming in a high-level language; introduction to computers; packaged software: statistical packages and spreadsheets; designed for business students. Prerequisite: 2 entrance units in Mathematics
CMPSC 211 INTRODUCTION TO SYSTEMS PROGRAMMING (3) Review of computer architecture concepts; assembly language programming, I/O routines, linkage and loading; microprocessor and large computer assembly languages. Prerequisite: CMPSC 120
CMPSC 399 (GI) FOREIGN STUDIES (1–12)
CMPSC 499 (GI) FOREIGN STUDIES (1–12)

COMPUTER SCIENCE (COMP)

Capital College

COMP 239APPLICATIONS OF COMPUTERS IN ENGINEERING TECHNOLOGY (3) Programming in a compiler language; introduction to numerical methods for solving mathematical engineering problems; projects involving simple engineering systems. Prerequisite: CMATH 220 or MATH 140
COMP 350 OBJECT-ORIENTED PROGRAMMING FOR MATHEMATICS AND SCIENCE I (3) Techniques and strategies for object-oriented programming, graphical user interfaces, overview of computer organization.
COMP 351 OBJECT-ORIENTED PROGRAMMING FOR MATHEMATICS AND SCIENCE II (3) Advanced techniques and strategies for object-oriented programming, graphical user interfaces, overview of computer organization. Prerequisite: COMP 350
COMP 397 SPECIAL TOPICS (1–9)
COMP 401 NUMERICAL ANALYSIS I (3) Algorithm efficiency and accuracy, function interpolation and polynomial approximation, numerical differentiation and integration, initial-value problems, and approximation of eigenvalues. Prerequisite: CSE 120, MA SC 460; COMP 351, COMP 408, COMP 430, COMP 432, or COMP 440
COMP 402 COMPUTER ORGANIZATION AND ARCHITECTURE (3) Data representation, digital logic, instruction set/control logic, machine/assembly languages, advanced architectures, memory hierarchy, I/O devices, overall system design. Prerequisite: CMPSC 201, COMP 351, COMP 408, COMP 430, COMP 432, COMP 440, CSE 103, CSE 120, or permission of program
COMP 403 ASSEMBLY LANGUAGE PROGRAMMING (3) Program design, addressing modes, subroutines, parameter passing, stacks, bit manipulation, text processing, DOS functions, macros, I/O, high level language interfaces. Prerequisite: CMPSC 201, COMP 351, COMP 408, COMP 430, COMP 432, COMP 440, CSE 103, or CSE 120
COMP 404 FORMAL LANGUAGES WITH APPLICATIONS (3) Regular, context free, and recursive languages; notations for language specification and applications. Prerequisite: CSE 120, MA SC 370; COMP 351, COMP 408, COMP 430, COMP 432, or COMP 440
COMP 406 COMPUTER GRAPHICS ALGORITHMS I (3) Coordinate systems, clipping, curves and regions, geometric transformations, parallel and projective projections, hidden line and surface removal, interactive techniques, animation. Prerequisite: MA SC 460; COMP 351, COMP 408, COMP 432, or COMP 440
COMP 407 STRUCTURED PROGRAMMING WITH PASCAL (3) Expression and statements, input and output, control structures, procedures and functions, arrays, files, pointers, and lists. Prerequisite: CMPSC 201, CSE 103, CSE 120
COMP 408 INTRODUCTORY ADA AND PROGRAM DESIGN (3) Structured program design using Ada; strong typing, data abstraction, packages, subprograms, separate compilation, visibility, exceptions, generic units. Prerequisite: CMPSC 201, COMP 351, COMP 430, COMP 432, COMP 440, CSE 103, or CSE 120
COMP 409 ADVANCED ADA PROGRAMMING LANGUAGE (3) Advanced types, exceptions, generic units, and tasking, and their use in software systems. Prerequisite: COMP 408
COMP 410 DATA STRUCTURES (3) Asymptotic notations, lists, stacks, queues, trees, balanced trees, self-adjusting data structures, hash tables, priority queues, bionomial heaps. Prerequisite: COMP 351, COMP 408, COMP 430, COMP 432, COMP 440, or CSE 120. Prerequisite or concurrent: MA SC 370
COMP 411 DESIGN AND ANALYSIS OF ALGORITHMS (3) Recurrences, algorithms design techniques, searching, sorting, selection, graph algorithms, NP-completeness, approximation algorithms. Prerequisite: COMP 410, MA SC 370. Prerequisite or concurrent: MA SC 420 or STAT 318
COMP 412 OPERATING SYSTEMS (3) Process management, synchronization, deadlocks, memory management, virtual memory, CPU and process scheduling, file systems, disk scheduling, security, protection, distributed systems. Prerequisite: COMP 402, COMP 410; COMP 408, COMP 430, COMP 432, or COMP 440

COMP 413W SOFTWARE ENGINEERING AND DESIGN (3) Requirements analysis, specification, design, expectation and testing strategies, development handling, development libraries, approaches to project management, and documentation. Prerequisite: COMP 410, MA SC 370
COMP 414 SYSTEMS SIMULATION (3) Monte Carlo technique, production simulation, analytical solutions, timekeeping, statistical verification, GPSS, simulation languages. Prerequisite: MA SC 422, STAT 451; COMP 408, COMP 430, COMP 432, or COMP 440
COMP 416 PRINCIPLES OF PROGRAMMING LANGUAGES (3) Design and implementation of high level programming languages and survey of programming language paradigms. Prerequisite: COMP 402, COMP 404, COMP 410
COMP 418 COMPILER CONSTRUCTION (3) Programming language structure, basic automata theory, design of a complier, scanning and parsing, semantic processing (including type checking), code generation, and error detection. Prerequisite: COMP 402, COMP 404, COMP 410
COMP 419 DATABASE DESIGN I (3) Relational database model, query languages, integrity, reliability, and normal forms for design. Prerequisite: COMP 410, MA SC 370; COMP 408, COMP 430, COMP 432, or COMP 440
COMP 420 ARTIFICIAL INTELLIGENCE (3) History of AI, problem solving, search techniques, knowledge representation, LISP, learning. Prerequisite: a high-level programming language such as Ada, Pascal, C, or C++ Concurrent: COMP 410
COMP 421 COMMUNICATIONS AND NETWORKING (3) Data transmission, basic signaling, data encoding, error control, communication protocols, security, network topologies, routing, switching, internetworking, emerging high speed networks. Prerequisite: COMP 402, CSE 120; COMP 408, COMP 430, COMP 432, or COMP 440
COMP 425 ADVANCED OPERATING SYSTEMS (3) Multiprocessing, resource sharing, strategies of resource management, real and virtual storage management, construction of a small operating system. Prerequisite: COMP 412
COMP 430 UNIX AND C (3) UNIX operating system, functions, libraries, programming style, operators and variables, data types, control statements, pointers, arrays, strings, lists, input/output, macros. (Students CANNOT take this course after having taken COMP 432.) Prerequisite: CMPSC 201, COMP 350, COMP 407, COMP 408, CSE 103, or CSE 120
COMP 432 OBJECT-ORIENTED PROGRAMMING WITH C++ (3) Object oriented design methods and programming in C++. Prerequisite: CMPSC 201, COMP 407, CSE 120
COMP 435 OBJECT-ORIENTED DESIGN (3) Object-oriented design methodologies and programming. Prerequisite: COMP 432 or COMP 440
COMP 440 OBJECT-ORIENTED PROGRAMMING WITH JAVA (3) Inheritance, polymorphism, exception handling, applet programming, Java graphics, and an overview of object-oriented design. Prerequisite: COMP 408, COMP 430, or COMP 432
COMP 495 INTERNSHIP (1–18)
COMP 496 INDEPENDENT STUDIES (1–18)
COMP 497 SPECIAL TOPICS (1–9)

COMPUTER SCIENCE AND ENGINEERING (CSE)

College of Engineering
CSE 097 SPECIAL TOPICS (1–9)
CSE 103 (GQ) INTRODUCTION TO PROGRAMMING TECHNIQUES (4) Design and implementation of algorithms. Structured programming. Problem solving techniques. Introduction to a high-level, block-structured language, including arrays, procedures, parameters, and recursion. A student may receive credit for only one of the following: CMPSC 101, 201C, 201F, CSE 103. Prerequisite: 2 entrance units in mathematics
CSE 120 INTERMEDIATE PROGRAMMING (3) Systematic programming: top-down program development, documentation, and testing. Introduction to data structures, text processing, numerical methods, algorithm analysis, program verification. Prerequisite: CMPSC 201C or CSE 103; MATH 140
CSE 260 DISCRETE MATHEMATICS FOR COMPUTER SCIENCE (3) Discrete mathematics and foundations for modern computer science. Topics include sets, relations, logic, algorithms, graphs, finite state machines and regular expressions. Prerequisite: CSE 120
CSE 271 INTRODUCTION TO DIGITAL SYSTEMS (3) Introduction to logic design and digital systems. Boolean algebra, and introduction to combinatorial and sequential circuit design and analysis. Concurrent: PHYS 202 or PHYS 212
CSE 275 DIGITAL DESIGN LABORATORY (1) Introduction to digital design techniques. Prerequisite: OR CONCURRENT: CSE 271
CSE 295 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
CSE 296 INDEPENDENT STUDIES (1–18)
CSE 297 SPECIAL TOPICS (1–9)
CSE 331 COMPUTER ORGANIZATION AND DESIGN (3) Introduction to major components of a computer system, how they function together in executing a program, how they are designed. Prerequisite: CSE 271; CMPSC 201C or CSE 120

CSE 411 OPERATING SYSTEMS (3) Design and implementation of computer operating systems; management of various system resources: processes, memory, processors, files, input/output devices. Prerequisite: CSE 465

CSE 413 PROJECTS IN COMPUTER SYSTEMS (3) Individual or team programming project in a specific aspect of computer systems: operating systems, compilers, database systems, networking, computer vision. Prerequisite: CSE 465

CSE 418 COMPUTER GRAPHICS (3) Fundamentals of computer graphics: input/output devices, transformation, projection, clipping, hidden line/surface elimination. Prerequisite: CSE 465

CSE 420W SOFTWARE DESIGN METHODS (3) Applications of scientific knowledge and methods in the design and construction of computer software using engineering concepts. Prerequisite: CSE 465, ENGL 202C

CSE 421 INTRODUCTION TO COMPILER CONSTRUCTION (3) Design and implementation of compilers; lexical analysis, parsing, semantic actions, optimization, and code generation. Prerequisite: CSE 428

CSE 428 PROGRAMMING LANGUAGE CONCEPTS (3) Fundamental concepts of programming language design, specification, and implementation; programming language paradigms and features; program vertification. Prerequisite: CSE 465

CSE 430W COMPUTER ENGINEERING PROJECT DESIGN (3) Computer engineering design project, project management, documentation, reporting, and group and individual communication skills. Prerequisite: CSE 331, CSE 465, ENGL 202C

CSE 431 INTRODUCTION TO COMPUTER ARCHITECTURE (3) Principles of computer architecture: memory hierarchies and design, I/O organization and design, CPU design and advanced processors. Prerequisite: CSE 331

CSE 441W INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS (3) Database system concepts: file organizations and retrieval algorithms; the three data models (relational, hierarchical, and network) and their database implementations. Prerequisite: CSE 465, ENGL 202C

CSE 447 (E E) DIGITAL INTEGRATED CIRCUITS (3) Analyses and design of digital integrated circuit building blocks, including logic gates, flip-flops, memory elements, analog switches, multiplexers, and converters. Prerequisite: E E 310

CSE 451 (MATH) NUMERICAL COMPUTATIONS (3) Algorithms for interpolation, approximation, integration, nonlinear equations, linear systems, fast FOURIER transform, and differential equations emphasizing computational properties and implementation. Students may take only one course for credit from CSE/MATH 451 and CSE/MATH 455. Prerequisite: MATH 230 or MATH 231; at least 3 credits in Computer Science and Engineering

CSE 455 (MATH) INTRODUCTION TO NUMERICAL ANALYSIS I (3) Floating point computation, numerical rootfinding, interpolation, numerical quadrature, direct methods for linear systems. Students may take only one course for credit from CSE (MATH) 451 and CSE (MATH) 455. Prerequisite: MATH 220; MATH 230 or MATH 231; 3 credits in Computer Science and Engineering

CSE 456 (MATH) INTRODUCTION TO NUMERICAL ANALYSIS II (3) Polynomial and Piecewise polynomial approximation, matrix least squares problems, numerical solution of eigenvalue problems, numerical solution of ordinary differential equations. Prerequisite: CSE 455

CSE 457 CONCURRENT SCIENTIFIC COMPUTING (3) An overview of scientific computing on modern high performance architectures emphasizing matrix computations and drawing upon recent research in the field. Prerequisite: CSE 103, CMPSC 201C, or CMPSC 201F; MATH 220; MATH 230 or MATH 231

CSE 458 (E E) COMMUNICATION NETWORKS (3) Data transmission, encoding, link control techniques; communication network architecture, design; computer communication system architecture, protocols. Prerequisite: CSE 271; E E 317 or E E 350

CSE 460 COMBINATORICS AND GRAPH THEORY (3) An introduction to combinatorics and graph theory, with emphasis on applications and their organization for solution on digital computers. Prerequisite: CSE 465

CSE 465 DATA STRUCTURES AND ALGORITHMS (3) Fundamental concepts of computer science: data structures, analysis of algorithms, recursion, trees, sets, graphs, sorting. Prerequisite: CSE 260 or MATH 311W

CSE 467 (MATH) FACTORIZATION AND PRIMALITY TESTING (3) Prime sieves, factoring, computer numeration systems, congruences, multiplicative functions, primitive roots, cryptography, quadratic residues. Students who have passed MATH 465 may not schedule this course. Prerequisite: CSE 260 OR MATH 311W

CSE 468 THEORY OF AUTOMATA, LANGUAGES, AND COMPUTABILITY (3) Finite machines and regular events, context-free languages and machines with push-down memory, effectiveness, undecidability, and Turing machines. Prerequisite: CSE 260 or MATH 311W

CSE 471 LOGICAL DESIGN OF DIGITAL SYSTEMS (3) Basic switching theory and design of digital circuits, including combinational, synchronous sequential, and asynchronous sequential circuits. Prerequisite: CSE 331

CSE 472 MICROPROCESSORS AND EMBEDDED SYSTEMS (3) Microprocessors: architecture, design, assembly language, programming, interfacing, bus structure, and interface circuits and their use in embedded systems. Prerequisite: CSE 331

CSE 473 MICROCOMPUTER LABORATORY (3) Design of digital systems using microprocessors. Prerequisite: CSE 472

CSE 477 VLSI DIGITAL CIRCUITS (3) Digital integrated circuit design, layout, simulation, and fabrication; VLSI design techniques and system architecture; computer-aided design tools and techniques. Prerequisite: CSE 471, E E 310

CSE 478 (E E) DIGITAL DESIGN USING FIELD PROGRAMMABLE DEVICES (3) Field programmable device architectures and technologies; rapid prototyping using top down design techniques; quick response systems. Prerequisite: CSE 331
CSE 481 INTRODUCTION TO ARTIFICIAL INTELLIGENCE I (3) Introduction to the theory, research paradigms, implementation techniques, and philosophies of artificial intelligence. Prerequisite: CSE 120
CSE 485 (E E) DIGITAL IMAGE PROCESSING (3) Overview of digital image processing techniques and their applications, image sampling, enhancement, restoration, and analysis; computer projects. Prerequisite: E E 317 or E E 350; CMPSC 201C or CSE 103
CSE 486 (E E) FUNDAMENTALS OF COMPUTER VISION (3) Introduction to topics such as image formation, segmentation, feature extraction, matching, shape recovery, object recognition, and dynamic scene analysis. Prerequisite: MATH 230 or MATH 231; CMPSC 201C or CSE 103
CSE 494H SENIOR HONORS THESIS (1–6) Supervised Honors thesis research in computer science and engineering. Prerequisite: approval of a thesis adviser in the department
CSE 496 INDEPENDENT STUDIES (1–18)
CSE 497, 498 SPECIAL TOPICS (1–9)

CORPORATE COMMUNICATION (CC)

Abington College
CC 401 CORPORATE, NON-PROFIT, AND GOVERNMENT PUBLIC RELATIONS (3) Explores issues affecting profit and non-profit public relations, including crisis management, consumer and employee affairs, environmental problems and global concerns. Prerequisite: MKTG 310 and sixth-semester standing
CC 402 THE MEDIA AND PUBLIC RELATIONS (3) Publicity strategies involving a variety of media resources. Prerequisite: MKTG 310 and sixth-semester standing
CC 403W STUDIES IN PUBLIC RELATIONS (3) Capstone course for the major in Corporate Communication; focuses on case studies in public relations: problems and solutions. Prerequisite: MKTG 310 and sixth-semester standing
CC 495A INTERNSHIP IN CORPORATE COMMUNICATION (3) Internship in a business or agency appropriate for a major in Corporate Communication. Prerequisite: MKTG 310 and sixth-semester standing

COUNSELING PSYCHOLOGY (CNPSY)

College of Education
CNPSY 497, 498. SPECIAL TOPICS (1–9)

COUNSELOR EDUCATION (CN ED)

College of Education
CN ED 097 SPECIAL TOPICS (1–9)
CN ED 098 SPECIAL TOPICS (1–9)
CN ED 100 EFFECTIVE CAREER DECISION-MAKING (3) Examination of internal and external factors that contribute to career development to assist students undecided about major or career.
CN ED 197 SPECIAL TOPICS (1–9)
CN ED 198 SPECIAL TOPICS (1–9)
CN ED 296 INDEPENDENT STUDIES (1–18)
CN ED 297 SPECIAL TOPICS (1–9)
CN ED 298 SPECIAL TOPICS (1–9)
CN ED 301 STUDENT ORGANIZATION MANAGEMENT (2) Exploration and development of leadership and group process skills necessary for effectively managing student organizations in higher education settings.
CN ED 302 THE ROLE OF THE RESIDENT ASSISTANT: THEORY AND PRACTICE (3) An analysis of the various roles of the resident assistant, including interpersonal facilitator, disciplinarian, program developer, and activities facilitator.
CN ED 303 CAREER SEARCH STRATEGIES FOR EDUCATORS (1) An aid in preparing students with information helpful for entry into education and alternative job markets.
CN ED 304 EDUCATION OF THE PEER ASSISTANT (3) Student development theories: skill development in listening, informing, and referring culturally diverse peers in individual and group situations. Prerequisite: limited to students selected as peer assistants or similar positions
CN ED 305 MANAGING STUDENT COMMUNITY SERVICE ORGANIZATIONS (3) Philosophy, principles, and practices of community service organizations and their leadership for students. Prerequisite: limited to leaders of student organizations
CN ED 397 SPECIAL TOPICS (1–9)
CN ED 398 SPECIAL TOPICS (1–9)
CN ED 401 FOUNDATIONS OF CHEMICAL DEPENDENCY COUNSELING (3) An overview of diagnosis and assessment, models for chemical dependency prevention, counseling, and recovery; contexts of chemical dependency treatment. Prerequisite: 3 credits in general psychology

CN ED 403 FOUNDATIONS OF GUIDANCE AND COUNSELING PROCESSES (3) Factors in personal choicemaking; rationale for and elements of guidance and counseling processes in school, college, and rehabilitation settings. Prerequisite: 6 credits in psychology and/or sociology
CN ED 404 GROUP PROCEDURES IN GUIDANCE AND COUNSELING (3) The nature and functioning of groups in educational and agency settings. Provides prospective counselors with experience in the group process. Prerequisite: 6 credits in counselor education; 6 credits in psychology, sociology, or individual and family studies
CN ED 407 INTRODUCTION TO VOCATIONAL REHABILITATION IN EMPLOYEE COUNSELING (3) Use of rehabilitation counseling skills in industrial employee counseling settings; case study and handling; resources for training. Prerequisite: 6 credits in individual and family studies, psychology, or sociology
CN ED 415 COUNSELING ADULTS (3) Roles of counselors and counseling in the resolution of educational and career problems and opportunities of adults. Prerequisite: COM S 448 , HD FS 249 , HD FS 445 , OR SOC 435
CN ED 416 INTERPERSONAL RELATIONSHIPS AND ALCOHOL AND OTHER DRUGS (AOD) DEPENDENCY (3) This course examines families with chemically dependent members, dynamics, appropriate interventions, and treatment. Prerequisite: CN ED 401 OR CN ED 403
CN ED 420 CHEMICAL DEPENDENCY: YOUTH AT RISK (3) Study of youth who are at-risk of developing chemical dependency including the characteristics and factors related to chemical dependency. Prerequisite: CN ED 401
CN ED 421 COUNSELING STRATEGIES FOR PREVENTING CHEMICAL DEPENDENCY (3) Examines helping professional's role in primary and secondary prevention of substance abuse, and related problems like delinquency, suicide, and pregnancy. Prerequisite: CN ED 401
CN ED 423 STUDENT ASSISTANCE PROGRAMS (3) Exploration of early stages of adolescent "at-risk" behavior and skills for student assessment and intervention within schools and communities. Prerequisite: CN ED 401
CN ED 470 WORKSHOP IN STUDIES IN COUNSELOR EDUCATION (1–6)
CN ED 496 INDEPENDENT STUDIES (1–18)
CN ED 497 SPECIAL TOPICS (1–9)
CN ED 498 SPECIAL TOPICS (1–9)

CRIMINAL JUSTICE (CJ)

Altoona College

CJ 100 INTRODUCTION TO CRIMINAL JUSTICE (3) Overview of the criminal justice system, including legal foundations, processing and correction of offenders, extent and types of crime, victims.
CJ 210 THE LAW ENFORCEMENT FUNCTION (3) Purpose and function of police in society, recruitment, training, duties, socialization; organization of police agencies.
CJ 220 COURTS AND THE PROSECUTION PROCESS (3) Purpose and function of criminal courts in society, organization, jurisdiction and staffing; prosecution, adjudication, and sentencing of offenders.
CJ 230 CORRECTIONS IN AMERICA (3) Punishment and treatment of sentenced offenders, correctional institution organization, staffing, inmates, and subcultures.
CJ 297 SPECIAL TOPICS (1–9)
CJ 420 CRIMINAL LAW AND PROCEDURE (3) Common law and statutory crimes; constitutional rights of accused persons, liability of criminal justice professionals. Prerequisite: CJ 220
CJ 430 COMMUNITY CORRECTIONS (3) Control and treatment of offenders in the community, probation and parole organizations, diversion programs, innovative sentences, supervision techniques. Prerequisite: CJ 230
CJ 450W CRIMINAL JUSTICE POLICY (3) Two major criminal justice paradigms of the late 20th Century; historical, political, and social contexts; policy initiatives and outcomes. Prerequisite: CJ 100 , CJ 212 , CJ 220 , CJ 230 , SOC 012
CJ 460 JUVENILE JUSTICE AND DELINQUENCY (3) Identification and processing of young offenders, delinquency correlates, juvenile courts, and corrections. Prerequisite: SOC 012
CJ 494 RESEARCH PROJECTS (1–12) Supervised student activities on research projects identified on an individual or small-group basis.
CJ 495 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
CJ 496 INDEPENDENT STUDIES (1–18)
CJ 497 SPECIAL TOPICS (1–9)
CJ 498 SPECIAL TOPICS (1–9)

CRIMINAL JUSTICE (CRIMJ)

Capital College

CRIMJ 200 (GS) INTRODUCTION TO CRIMINAL JUSTICE (3) Comprehensive examination of the field of criminal justice as an applied interdisciplinary science. Prerequisite: fourth-semester standing
CRIMJ 201 (GI) AMERICAN LEGAL SYSTEM (3) Historical introduction to Anglo-American law, systematic analysis of the court systems and trial procedures, and investigation of legal reasoning. Prerequisite: CRIMJ 200

CRIMJ 202 (DF) CORRECTIONS AND REHABILITATION (3) A review of the social reaction to crime as it focuses on the methods of punishment and attempts at rehabilitation. Prerequisite: CRIMJ 200
CRIMJ 203 POLICING IN AMERICA (3) Police organization and operations in America. Prerequisite: CRIMJ 200
CRIMJ 241 (PUBPL) COMPUTER APPLICATIONS IN PUBLIC AFFAIRS/CRIMINAL JUSTICE (3) Introduction to computer applications for criminal justice and public affairs agencies.
CRIMJ 301 (GI) AMERICAN LEGAL SYSTEM (3) Historical introduction to Anglo-American law, systematic analysis of the court systems and trial procedures, and investigation of legal reasoning. Prerequisite: CRIMJ 200
CRIMJ 302 (DF) CORRECTIONS AND REHABILITATION (3) A review of the social reaction to crime as it focuses on the methods of punishment and attempts at rehabilitation. Prerequisite: CRIMJ 200
CRIMJ 303 (DF) LAW ENFORCEMENT ADMINISTRATION (3) Principles of administration as they relate to a police organization; policy development, public relations, personnel management, budgeting and operation. Prerequisite: CRIMJ 200 OR SOCIO 484
CRIMJ 304 SECURITY ADMINISTRATION (3) Interdisciplinary analysis of security and loss prevention; its administration, role in crime control and prevention, and relationship to criminal justice.
CRIMJ 305 THEORIES OF CRIME AND DELINQUENCY (3) A critical interdisciplinary analysis of traditional and contemporary theories of crime and delinquency. Prerequisite: CRIMJ 200
CRIMJ 320 (PUBPL) STATISTICAL ANALYSIS FOR THE SOCIAL SCIENCES (4) Methods of collection, presentation, and analysis of quantitative data in the social science; procedures, interpretation, and application.
CRIMJ 388 ETHICS IN CRIMINAL JUSTICE (3) Ethical behavior in the criminal justice system. Prerequisite: CRIMJ 200
CRIMJ 389 GANGS AND GANG BEHAVIOR (3) The history, structure, and practices of gangs in America as well as societal reaction to them.
CRIMJ 401 CRITICAL ISSUES IN CRIMINAL JUSTICE (3 per semester) A review of the current controversies and debates in the criminal justice field. May be repeated for credit. Prerequisite: CRIMJ 200
CRIMJ 403 (GI) JUVENILE LAW AND JUSTICE (3) An examination of the organization, operations, and goals of the juvenile justice system. Prerequisite: CRIMJ 200 or permission of the program
CRIMJ 404 CRIMINAL JUSTICE PLANNING (3) An analysis of planning and evaluation methods and their utilization in the criminal justice field. Prerequisite: CRIMJ 200
CRIMJ 406 (DF) OFFENDER AND PRISONER RIGHTS (3) The identification of correctional problems and the setting of objectives as reflective of court rulings, legislative change, and administrative law. Prerequisite: CRIMJ 201 , CRIMJ 202
CRIMJ 407 (GI) VICTIMOLOGY (3) This course will explore the legal, emotional, and social responses to the process of victimization by offenders and third parties.
CRIMJ 408 (DF) LEGAL ASPECTS OF LAW ENFORCEMENT ADMINISTRATION (3) Legal requirements and constraints associated with the administration of a law enforcement agency; employee-initiated litigation. Prerequisite: CRIMJ 201
CRIMJ 410 THE PENNSYLVANIA COURT SYSTEM (3) Tracing the steps of criminal cases through the investigative stage, arrest, trial, sentencing and appellate review in Pennsylvania. Prerequisite: CRIMJ 200 , CRIMJ 201
CRIMJ 411 ALTERNATIVES TO INCARCERATION (3) An evaluation of public and private agency programs directed at the treatment of the offender in the community. Prerequisite: CRIMJ 200 , CRIMJ 202
CRIMJ 415 (PUBPL) DRUG CONTROL POLICY IN COMPARATIVE PERSPECTIVE (3) Examines the history of drug control policy in the United States; comparisons and contrasts with other countries' experiences. Prerequisite: CRIMJ 200 or PL SC 001 or PL SC 014 or SOC 001
CRIMJ 430 CRIMINAL LAW (3) An overview of the procedural aspects of American criminal law with special emphasis on Supreme Court precedents. Prerequisite: CRIMJ 200 , CRIMJ 201
CRIMJ 436 (GI) (WOMST) WOMEN IN THE CRIMINAL JUSTICE SYSTEM (3) This culturally diverse course will analyze the status of women in all aspects of the criminal justice system. Prerequisite: fifth semester standing
CRIMJ 450W CRIMINAL JUSTICE RESEARCH METHODS (3) A review of sociological methods as applied to criminal justice research studies. Prerequisite: CRIMJ 200 and SCLSC 320 or STAT 200
CRIMJ 489W VICTIMOLOGY: PREDATORY CRIME (3) This course uses medical, social scientific and legal research to study the complexities of predatory crime. Prerequisite: CRIMJ 407
CRIMJ 490W SEMINAR IN CRIMINAL JUSTICE (3) A review of the current controversies and debates in the criminal justice field. Prerequisite: CRIMJ 200 , CRIMJ 305
CRIMJ 494 RESEARCH TOPICS (1–12) Supervised student activities on research projects identified on an individual or small-group basis.
CRIMJ 495 PRACTICUM IN CRIMINAL JUSTICE (3–12) Experience with a criminal justice agency coordinated through readings and discussion. Prerequisite: CRIMJ 200 , CRIMJ 201 , CRIMJ 202 , CRIMJ 303 , CRIMJ 305 , CRIMJ 388 , CRIMJ 450W , PUBPL 241
CRIMJ 496 INDEPENDENT STUDIES (1–18)
CRIMJ 497 SPECIAL TOPICS (1–9)

CURRICULUM AND INSTRUCTION (C I)

College of Education

C I 295 INTRODUCTORY FIELD EXPERIENCE FOR TEACHER PREPARATION (1–3 per semester, maximum of 6) Selected observation of schooling situations with small group and tutorial participation. Prerequisite: second-semester standing Concurrent: EDTHP 115 and/or EDPSY 014

C I 296 INDEPENDENT STUDIES (1–18)

C I 297, 298 SPECIAL TOPICS (1–9)

C I 400 INTRODUCTION TO RESEARCH LITERATURE (3) Introduction to research literature and methodology; stress on interpretation, sources, and research reporting. Prerequisite: student teaching or teaching experience

C I 408 METHODS OF TEACHING BASIC SKILLS (4–6) Strategies and materials for teaching basic skills in the elementary and secondary schools. Prerequisite: EDPSY 010 or PSY 213; EDPSY 014; SPLED 105 or SPLED 400

C I 412W SECONDARY TEACHING (3) Study of the teacher's responsibilities, steps in planning instruction, and various strategies for implementing and assessing teaching. Prerequisite: C I 295, EDPSY 014, EDTHP 115, and statistics selection

C I 494H RESEARCH TECHNIQUES IN CURRICULUM AND INSTRUCTION (1–3) Examination, application, assessment, and presentation of research modes and techniques in Curriculum and Instruction. Limited to University scholars in the College of Education. Prerequisite: second-semester standing

C I 495 INTERNSHIP (1–18)

C I 495A CLINICAL APPLICATION OF INSTRUCTION—EARLY CHILDHOOD EDUCATION (3) Practicum situation for demonstration of selected instructional strategies and management skills acquired in professional training. To be offered only for Satisfactory/Unsatisfactory grading. Prerequisite: C I 295, EDPSY 014, EDTHP 115. PA Act 34 clearance required. In addition, non-Pennsylvania residents must provide evidence of an FBI background information check. (Forms: 228 Chambers) Concurrent: regular professional methods courses in area of certification.

C I 495B CLINICAL APPLICATION OF INSTRUCTION—ELEMENTARY AND KINDERGARTEN EDUCATION (3) Practicum situation for demonstration of selected instructional strategies and management skills acquired in professional training. To be offered only for Satisfactory/Unsatisfactory grading. Prerequisite: C I 295, EDPSY 014, EDTHP 115. PA Act 34 clearance required. In addition, non-Pennsylvania residents must provide evidence of an FBI background information check. (Forms: 228 Chambers) Concurrent: MTHED 420, SCIED 458, SS ED 430W

C I 495C CLINICAL APPLICATION OF INSTRUCTION—SECONDARY EDUCATION (3) Practicum situation for demonstration of selected instructional strategies and management skills acquired in professional training. To be offered only for Satisfactory/Unsatisfactory grading. Prerequisite: C I 295, EDPSY 014, EDTHP 115. PA Act 34 clearance required. In addition, non-Pennsylvania residents must provide evidence of an FBI background information check. (Forms: 228 Chambers) Concurrent: C I 412 and special methods course(s) in area of certification

C I 495D PRACTICUM IN STUDENT TEACHING—ELEMENTARY AND KINDERGARTEN EDUCATION (12) Full-time classroom instruction in early childhood and elementary education. Students supervised by University personnel and practicing teachers. No concurrent courses other than C I 495F permitted. Prerequisite: C I 495A or C I 495B; a grade of C or higher in all specified and professional courses. PA Act 34 clearance required. In addition, non–Pennsylvania residents must provide evidence of an FBI background check. (Forms: 228 Chambers)

C I 495E PRACTICUM IN STUDENT TEACHING—SECONDARY EDUCATION (15) Full-time classroom instruction in secondary education. Students supervised by university personnel and practicing teachers. No concurrent courses permitted. Prerequisite: C I 495C, seventh-semester standing, and grade of C or higher in all specified and professional courses. PA Act 34 clearance required. In addition, non-Pennsylvania residents must provide evidence of an FBI background information check. (Forms: 228 Chambers)

C I 495F PROFESSIONAL DEVELOPMENT PRACTICUM (3) Instruction concurrent with student teaching practicum. Students focus on the solution of instructional problems identified at the practicum site. Prerequisite: PA Act 34 clearance required. In addition, non-Pennsylvania residents must provide evidence of an FBI background information check. (Forms: 228 Chambers) Concurrent: C I 495D

C I 496 INDEPENDENT STUDIES (1–18)

C I 497, 498 SPECIAL TOPICS (1–9)

CURRICULUM AND SUPERVISION (C & S)

College of Education

C & S 298 SPECIAL TOPICS (1–9)

C & S 401 MEASUREMENT AND EVALUATION OF INSTRUCTION, K-12 (3) Developing tests used for appraising academic growth of students, application of specific evaluative activities associated with student progress. Prerequisite: EDTHP 115 or Education Theory and Policy selection; EDPSY 014

C & S 405 STRATEGIES IN CLASSROOM MANAGEMENT (3) Managing and coping with disruptive student behavior in instructional settings so that they support the teaching/learning process. Prerequisite: teaching experience or supervised practicum experience

C & S 470 WORKSHOP IN SELECTED STUDIES IN CURRICULUM (1–6) Intensive work on selected cur-

rent problems in curriculum. Prerequisite: 12 credits in education and teaching experience
C & S 471 WORKSHOP IN SELECTED STUDIES IN SUPERVISION (1–6) Intensive work on selected current problems in supervision. Prerequisite: 12 credits in education and teaching experience
C & S 496 INDEPENDENT STUDIES (1–18)
C & S 497, 498 SPECIAL TOPICS (1–9)

DANCE (DANCE)

College of Arts and Architecture
DANCE 101 DANCE AND RHYTHMIC FUNDAMENTALS (1) Fundamental components of rhythm, dance movement, and technique.
DANCE 231 BEGINNING BALLET I (1) An introduction to the techniques of ballet. Prerequisite: admission into Musical Theatre Option
DANCE 232 BEGINNING BALLET II (I) A continuation of Beginning Ballet I to augment technical proficiency. Prerequisite: DANCE 231
DANCE 241 BEGINNING JAZZ I (1) An introduction to the techniques of Jazz dance. Prerequisite: DANCE 232
DANCE 242 BEGINNING JAZZ II (1) A continuation of Beginning Jazz I to augment technical proficiency. Prerequisite: DANCE 241
DANCE 251 BEGINNING TAP I (1) An introduction to the technique of tap dance. Prerequisite: DANCE 232
DANCE 252 BEGINNING TAP II (1) A continuation of Beginning Tap I to augment technical proficiency. Prerequisite: DANCE 251
DANCE 261 (GA) BEGINNING MODERN DANCE I (1) Introduction to modern dance as an art form; development of dance technique and composition; teaching methods for improvisational skills.
DANCE 262 BEGINNING MODERN DANCE II (1) A continuation of Beginning Modern Dance I to augment technical proficiency and to further comprehension of choreographic methods. Prerequisite: DANCE 261
DANCE 270 (GHA) INTRODUCTION TO BARTENIEFF FUNDAMENTALS (3) Physical and theoretical approach to movement: facilitates efficiency, and expression through dynamic alignment, mobility, kinesthetic awareness; reduce physical injuries.
DANCE 280 DANCE IMPROVISATION (1) Introduction to the concepts and techniques of dance improvisation. Prerequisite: DANCE 261
DANCE 281 INTRODUCTION TO AFRICAN DANCE AND CULTURE (1) An introduction to African dance based in a holistic approach integrating music, movement, drama, costume, and vocalization.
DANCE 296 INDEPENDENT STUDIES (I–18)
DANCE 297 SPECIAL TOPICS (I–9)
DANCE 301 MOVEMENT ANALYSIS (2) Introduce student to principles of practical and abstract movement analysis to determine individual physical limitations and potentials.
DANCE 331 INTERMEDIATE BALLET I (I) A continuation of the course work established in Beginning Ballet II. Prerequisite: DANCE 232
DANCE 332 INTERMEDIATE BALLET II (I) A continuation of the course work established in Beginning Ballet I. Prerequisite: DANCE 331
DANCE 341 INTERMEDIATE JAZZ I (1) A continuation of the course work established in DANCE 242, Beginning Jazz II. Prerequisite: DANCE 242
DANCE 342 INTERMEDIATE JAZZ II (I) A continuation of the course work established in DANCE 341, Intermediate Jazz I. Prerequisite: DANCE 341
DANCE 351 INTERMEDIATE TAP I (1) A continuation of the course work established in DANCE 252, Beginning Tap II. Prerequisite: DANCE 252
DANCE 352 INTERMEDIATE TAP II (1) A continuation of the course work established in DANCE 351, Intermediate Tap I. Prerequisite: DANCE 351
DANCE 361 INTERMEDIATE MODERN DANCE I (1) Development of techniques and principles of modern dance on the intermediate level. Prerequisite: DANCE 262
DANCE 362 INTERMEDIATE MODERN DANCE II (I) A continuation of Modern Dance I to augment technical proficiency. Prerequisite: DANCE 361
DANCE 371 MUSIC THEATRE DANCE—STYLE I (1) A practical study of dance styles from the 1890'S to the 1990'S. Prerequisite: THEA 224
DANCE 372 MUSIC THEATRE DANCE—STYLE II (1) A continuation of course work established in Music Theatre Dance Style I. Prerequisite: DANCE 371
DANCE 380 DANCE PROGRAMMING (2) Theoretical and practical experiences in dance production and implementation of dance programs in various environments.
DANCE 381 DANCE COMPOSITION I (1) Introduction to the basic principles and craft of choreography.
DANCE 382 DANCE COMPOSITION II (1) A continuation of the principles and craft of Dance Composition I. Prerequisite: DANCE 381
DANCE 385 LEADERSHIP PRACTICUM: DANCE (1) Supervised experiences in teaching and assisting with the teaching of dance techniques. Prerequisite: DANCE 362
DANCE 431 ADVANCED BALLET I (1) An advanced ballet training course. Prerequisite: DANCE 232
DANCE 432 ADVANCED BALLET II (I) A continuation of Advanced Ballet I to augment technical proficiency. Prerequisite: DANCE 431

DANCE 441 ADVANCED JAZZ I (1) An advanced course in the techniques of jazz dance. Prerequisite: DANCE 242
DANCE 442 ADVANCED JAZZ II (1) A continuation of Advanced Jazz I to augment technical proficiency. Prerequisite: DANCE 441
DANCE 451 ADVANCED TAP I (1) An advanced course in the techniques of tap dance. Prerequisite: DANCE 252
DANCE 452 ADVANCED TAP II (1) A continuation of Advanced Tap I to augment technical proficiency. Prerequisite: DANCE 451
DANCE 461 ADVANCED MODERN DANCE I (1) Development of dance technique and movement combinations on the advanced level. Prerequisite: DANCE 362
DANCE 462 ADVANCED MODERN DANCE II (1) A continuation of Advanced Modern Dance I to augment technical proficiency. Prerequisite: DANCE 461
DANCE 480 CHOREOGRAPHIC PROJECTS (1) Choreographic practicum experiences for concert performances. Prerequisite: DANCE 382
DANCE 482 INTRODUCTION TO LABAN MOVEMENT ANALYSIS (3) Observe and analyze movement elements by exploring concepts of Body, Effort, Shape, and Space to increase personal communication and expression.
DANCE 484 DANCE HISTORY (3) Survey of dance history concerning perspectives of culture, race, and gender with a focus on Nineteenth and Twentieth centuries.
DANCE 485 CONTEMPORARY DANCE REPERTORY (1) An advanced dance course in the choreographic process with emphasis on original choreography in performance.
DANCE 496 INDEPENDENT STUDIES (1–18)
DANCE 497 SPECIAL TOPICS (1–9)

DIETETIC FOOD SYSTEMS MANAGEMENT (D S M)

College of Health and Human Development

D S M 100 THE PROFESSION OF DIETETICS (1) Introduction to the profession and exploration of the roles and responsibilities of dietetic professionals.
D S M 101 FOOD SAFETY AND SANITATION (1–3) Principles and procedures to insure food safety, using hazard analysis, critical control processes to manage a quantity food service sanitation systems.
D S M 102 INTRODUCTION TO DIETARY MANAGEMENT (1) Introduction to the profession and exploration of the roles and responsibilities of the dietary manager.
D S M 105 INTRODUCTION TO SCHOOL FOOD SERVICE (2) History of school food service programs and exploration of management opportunities, methods, and concepts of various food service systems.
D S M 195 FIELD EXPERIENCE IN COMMUNITY DIETETICS (3) Planning, preparation, and field experiences in community dietetic programs. Prerequisite: NUTR 151, 3 credits in sociology
D S M 204 MARKETING OF CHILD NUTRITION PROGRAMS (3) Theories and applications of marketing principles to the design of consumer- oriented school foodservice and child nutrition services.
D S M 205 HUMAN RESOURCE MANAGEMENT IN FOOD SERVICE OPERATIONS (3) Theories and principles of supervision and training food service employees for overall operational effectiveness.
D S M 250 PRINCIPLES OF QUANTITY FOOD PRODUCTION (3) Principles and methods of quantity food production including preparation techniques, quality control and evaluation, and cost control.
D S M 260 MANAGEMENT AND ANALYSIS OF QUANTITY FOOD (4) Principles of management applied to menu planning, purchasing, food and labor costing, and analysis for the institutional food service setting. Prerequisite: D S M 250
D S M 275 COST CONTROL IN INSTITUTIONAL FOODSERVICE (3) Analysis and application of revenue management and cost control principles in institutional foodservice systems. Prerequisite: D S M 260
D S M 280 (NUTR) CURRENT ISSUES IN COMMUNITY DIETETICS (3) Current issues impacting community dietetics programs with emphasis on the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). Prerequisite: D S M 195
D S M 281 (NUTR) FACILITATED DISCUSSION IN COMMUNITY DIETETICS (2) Principles and methods of designing, implementing, and evaluating facilitated discussion to provide effective nutrition education. Prerequisite: D S M 280
D S M 295A FIELD EXPERIENCE IN FOODSERVICE MANAGEMENT (1–4) Supervised experience in a foodservice operation: analysis of food service systems. Prerequisite: prerequisite or concurrent: D S M 260
D S M 295W PROFESSIONAL STAFF FIELD EXPERIENCE (4) Methods of, and practice in, the client-oriented dietetic systems. Prerequisite: D S M 195, D S M 205, D S M 260; NUTR 151 OR NUTR 251
D S M 296 INDEPENDENT STUDIES (1–18)

EARLY CHILDHOOD EDUCATION (E C E)

College of Education

E C E 298 SPECIAL TOPICS (1–9)
E C E 451 INSTRUCTION IN EARLY CHILDHOOD EDUCATION DERIVED FROM DEVELOPMENT THEORIES (3) Curriculum and instruction for early childhood education; program practice with pluralistic theoretical foundations for early childhood education. Prerequisite: HD FS 229, HD FS 428, HD FS 429, or PSY 213

E C E 452 APPROACHES TO CONTEMPORARY EARLY CHILDHOOD EDUCATION PROGRAMS (3) Description and analysis of early childhood programs; cycles, trends, progressions in early childhood education. Prerequisite: E C E 451
E C E 453 PARENT INVOLVEMENT IN HOME, CENTER, AND CLASSROOM INSTRUCTION (2–3) Parent involvement, programs, and methodologies that strengthen bonds between home and community for educators of children. Prerequisite: 6 credits in education
E C E 454 (HD FS) DEVELOPMENT AND ADMINISTRATION OF CHILD SERVICE PROGRAMS (3) Planning, administering, and evaluating child service programs at several administrative levels using methods from relevant disciplines. Prerequisite: HD FS 453; C I 295 or HD FS 330
E C E 479 THE YOUNG CHILD'S PLAY AS EDUCATIVE PROCESSES (3) Young child's play as educative processes and uses of materials in curricular settings are examined. Prerequisite: E C E 451; HD FS 229 or HD FS 429 or PSY 425
E C E 496 INDEPENDENT STUDIES (1–18)
E C E 497, 498 SPECIAL TOPICS (1–9)

EARTH AND MINERAL SCIENCES (EM SC)

College of Earth and Mineral Sciences
EM SC 097 SPECIAL TOPICS (1–9)
EM SC 100S (GWS) EARTH AND MINERAL SCIENCES FIRST-YEAR SEMINAR (3) Writing, speaking, and critical thinking skills applied to topics of general interest in Environmental and Materials Science.
EM SC 121 (GN) MINERALS AND MODERN SOCIETY (3) Production and use of mineral resources in modern society with an emphasis on the interrelationships and their effect on the Earth system.
EM SC 150 (GN) (S T S) OUT OF THE FIERY FURNACE (3) A history of materials, energy and man, with emphasis on their interrelationships. For nontechnical students.
EM SC 294 RESEARCH PROJECT COURSES (1–12)
EM SC 297 SPECIAL TOPICS (1–9)
EM SC 300 PROFESSIONAL E-PORTFOLIO DEVELOPMENT (1 per semester, maximum of 4) Design, creation and critique of on-line portfolios for personal and professional development. This course is for second-, third-, and fourth- year EMS students.
EM SC 301 GLOBAL FINANCE FOR THE EARTH, ENERGY, AND MATERIALS INDUSTRIES (3) The aim of this course is to introduce fundamental concepts of financial management and illustrate their global applications.
EM SC 304 GLOBAL MANAGEMENT FOR THE EARTH, ENERGY, AND MATERIALS INDUSTRIES (3) This class is designed to introduce students to modern management and organization strategies for resource businesses. Prerequisite: ECON 002
EM SC 401 GLOBAL BUSINESS LEADERSHIP STRATEGIES FOR THE EARTH, ENERGY, AND MATERIALS IND USTRIES (3) This course will provide students with a knowledge of the policy, regulation, and market information needs for strategic decision making. Prerequisite: junior, senior standing with backgrounds in earth and mineral sciences or business
EM SC 420 (SOC;S T S) ENERGY AND MODERN SOCIETY (3) Technology and economics of energy resources, production, and consumption; environmental factors, exhaustion, new technology.
EM SC 440 SCIENCE DIVING (3) Advanced scuba diving skills applied to underwater research. Prerequisite: basic and second level open water scuba certification from an internationally recognized certification agency, and a minimum of 20 additional logged dives beyond the basic certification dives.
EM SC 468 COMPUTATIONAL THINKING IN EARTH SYSTEMS (3) Development and application of computational protocols used in earth sciences.
EM SC 470W UNDERGRADUATE COLLABORATIVE RESEARCH IN EARTH AND MATERIALS SCIENCES (3–6) Interdisciplinary research seminar involving students in the process of discovery, writing, and debate on issues of broad interest to Earth and Materials Sciences.
EM SC 494 RESEARCH PROJECT COURSES (1–12)
EM SC 496 INDEPENDENT STUDIES (1–18)
EM SC 497 SPECIAL TOPICS (1–9)

EARTH SCIENCES (EARTH)

College of Earth and Mineral Sciences
EARTH 002 (GN) GAIA-THE EARTH SYSTEM (3) An interdisciplinary introduction to the processes, interactions and evolution of the earth's biosphere, geosphere and hydrosphere.
EARTH 002L (GN) GAIA-THE EARTH SYSTEM (3) An interdisciplinary introduction to the processes, interactions and evolution of the earth's biosphere, geosphere and hydrosphere.
EARTH 002P (GN) GAIA-THE EARTH SYSTEM An interdisciplinary introduction to the processes, interactions and evolution of the earth's biosphere, geosphere and hydrosphere.
EARTH 002S (GN) GAIA-THE EARTH SYSTEM (3) An interdisciplinary introduction to the processes, interactions and evolution of the earth's biosphere, geosphere and hydrosphere.
EARTH 100 (GN) ENVIRONMENT EARTH (3) Natural processes and their relationship to anthropogenic influences. General principles of global cycles and the role they play in natural hazards, global warming, ozone depletion, etc.

EARTH 101 (GN) NATURAL DISASTERS: HOLLYWOOD VS. REALITY (3) Analysis of the causes and consequences of natural disasters; comparison of popular media portrayal of disasters with perspective from scientific research.
EARTH 103 (GN) EARTH IN THE FUTURE: PREDICTING CLIMATE CHANGE AND ITS IMPACTS OVER THE NEX T CENTURY (3) Climate predictions for the coming century are utilized to examine potential impacts on regions, sectors of society, and natural ecosystems.
EARTH 105 (GN;GI) (AAA S) ENVIRONMENTS OF AFRICA: GEOLOGY AND CLIMATE CHANGE (3) Significant natural features of Africa as related to human endeavor; case studies include the Nile, climate change, natural resources.
EARTH 150 (GN) DINOSAUR EXTINCTIONS AND OTHER CONTROVERSIES (3) Dinosaur extinctions and other major and controversial events in the history of life.
EARTH 296 INDEPENDENT STUDIES (1–18)
EARTH 297 SPECIAL TOPICS (1–9)
EARTH 298 SPECIAL TOPICS (1–9)
EARTH 400 EARTH SCIENCES SEMINAR (3) Interdisciplinary study of environmental problems in the earth sciences. Prerequisite: seventh-semester standing in the Earth major
EARTH 402 EVOLUTION OF THE ATMOSPHERE AND OCEANS (3) A quantitative journey through the history of atmospheric and oceanic composition and the earth's climate. Prerequisite: CHEM 012, MATH 140, PHYS 201
EARTH 495 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
EARTH 496 INDEPENDENT STUDIES (1–18)
EARTH 497 SPECIAL TOPICS (1–9)
EARTH 498 SPECIAL TOPICS (1–9)

EAST ASIAN STUDIES (EA ST)

College of the Liberal Arts
EA ST 187 EAST ASIAN STUDIES FRESHMAN SEMINAR (3) The meaning and advantages of a Liberal Arts education in context of a specific discipline.
EA ST 197, 297, 497 SPECIAL TOPICS (1–9)
EA ST 199 299, 399, 499 (GI) FOREIGN STUDIES (1–12)
EA ST 296, 496 INDEPENDENT STUDIES (1–18)
EA ST 395 INTERNSHIP (1–18)
EA ST 401 EAST ASIAN STUDIES (3–6) An interdisciplinary, variable content, lecture-discussion course on the history, culture, politics, and international relations of China, Japan, and Korea. Prerequisite: 6 credits from courses in the East Asian Studies program

ECONOMICS (ECNMS)

Capital College
ECNMS 312 THE STRUCTURE OF INDUSTRY (3) Industrial concentration, size and efficiency of business firms; market structure and performance, competitive behavior; public policy. Prerequisite: ECON 002, ECON 004; or PUBPL 350
ECNMS 313 MONEY AND BANKING (3) Money, credit, commercial and central banking, financial intermediaries, treasury operations, monetary theory and policy, and foreign exchange. Prerequisite: ECON 002, ECON 004; or PUBPL 350
ECNMS 416 PUBLIC FINANCE (3) Practices and policies of taxation, borrowing, and spending of governmental units. Prerequisite: ECON 002, ECON 004; or PUBPL 350
ECNMS 417 INTRODUCTION TO BUSINESS ECONOMICS (3) The study of economic theory as it relates to the problems of the firm. Prerequisite: ECON 002, ECON 004
ECNMS 418 INTERNATIONAL TRADE AND POLICY (3) Issues of economic interaction between nations through trade that include gains from trade, protectionism, exchange determination and international policy coordination. Prerequisite: ECON 002
ECNMS 494 RESEARCH PROJECT (1–12)
ECNMS 496 INDEPENDENT STUDIES (1–18)
ECNMS 497 SPECIAL TOPICS (1–9)

ECONOMICS (ECNS)

Penn State Erie, The Behrend College
ECNS 097 SPECIAL TOPICS (1–9)
ECNS 294 RESEARCH PROJECT (1–12)
ECNS 296 INDEPENDENT STUDIES (1–18)
ECNS 297 SPECIAL TOPICS (1–9)
ECNS 397 SPECIAL TOPICS (1–9)

ECNS 410 ECONOMICS OF LABOR MARKETS (3) Economic analysis of the employment relationship from the microeconomic perspective, with emphasis on current labor-market problems and public policy issues. Prerequisite: ECON 002
ECNS 420 MONEY, BANKING, AND ECONOMIC ACTIVITY (3) Analysis of money and credit, commercial banking and nonbank intermediaries; their effects on the economy; and monetary theory and policy. Prerequisite: ECON 002, ECON 004
ECNS 430 REGIONAL ECONOMIC ANALYSIS (3) Analysis of personal and industrial location decisions, regional economic growth, migration patterns, and regional policy; emphasis on tools and techniques. Prerequisite: ECON 002 or ECON 004
ECNS 440 INDUSTRIAL ORGANIZATION (3) Market structure, industrial concentration, firm behavior, efficiency of markets, and public policy. Prerequisite: ECON 002
ECNS 450 MANAGERIAL ECONOMICS (3) Application of economic theory to managerial decision making; risk, uncertainty; models and statistical techniques. Prerequisite: ECON 002
ECNS 460 BUSINESS FORECASTING TECHNIQUES (3) A survey of contemporary business forecasting techniques, with emphasis on smoothing, decomposition, and regression techniques. Prerequisite: MS&IS 200 or STAT 200
ECNS 462 ADVANCED BUSINESS FORECASTING TECHNIQUES (3) Advanced forecasting, time-series models, Box-Jenkins methodology, model identification, estimation, and diagnostic checking. Prerequisite: MS&IS 200 or STAT 200
ECNS 470 INTERNATIONAL TRADE AND FINANCE (3) Economic analysis of why nations trade, barriers to trade, the international monetary system, and macroeconomic policy in an open economy. Prerequisite: ECON 002 or ECON 004
ECNS 485 ECONOMETRIC TECHNIQUES (3) Applying statistical techniques to test and explain economic relationships; integration of economic theory with observed economic phenomena. Prerequisite: ECON 002 or ECON 004; MS&IS 200 or STAT 200
ECNS 494 RESEARCH PROJECT (1–12)
ECNS 495 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: PRIOR APPROVAL OF PROPOSED ASSIGNMENT BY INSTRUCTOR
ECNS 496 INDEPENDENT STUDIES (1–18)
ECNS 497 SPECIAL TOPICS (1–9)

ECONOMICS (ECON)

Smeal College of Business

ECON 002 (GS) INTRODUCTORY MICROECONOMIC ANALYSIS AND POLICY (3) Methods of economic analysis and their use; price determination; theory of the firm; distribution.
ECON 004 (GS) INTRODUCTORY MACROECONOMIC ANALYSIS AND POLICY (3) National income measurement; aggregate economic models; money and income; policy problems.
ECON 014 (GS) PRINCIPLES OF ECONOMICS (3) Analysis of the American economy, emphasizing the nature and interrelationships of such groups as consumers, business, governments, labor, and financial institutions. Students who have passed ECON 002 or 004 or are registered in the College of Business Administration may not schedule this course.
ECON 083S (GS) FIRST-YEAR SEMINAR IN ECONOMICS (3) Experiments in microeconomic principles.
ECON 187 ECONOMICS FRESHMAN SEMINAR (3) The meaning and advantages of a Liberal Arts education in context of a specific discipline. Prerequisite: first-semester standing and enrollment in the College of the Liberal Arts
ECON 197 SPECIAL TOPICS (1–9)
ECON 199 (GI) FOREIGN STUDIES (1–12)
ECON 294 RESEARCH PROJECT (1–12)
ECON 297 SPECIAL TOPICS (1–9)
ECON 299 (GI) FOREIGN STUDIES (1–12)
ECON 302 (GS) INTERMEDIATE MICROECONOMIC ANALYSIS (3) Allocation of resources and distribution of income within various market structures, with emphasis on analytical tools. Prerequisite: ECON 002
ECON 304 (GS) INTERMEDIATE MACROECONOMIC ANALYSIS (3) Analysis of forces that determine the level of aggregate economic activity. Prerequisite: ECON 004
ECON 315 (GS) LABOR ECONOMICS (3) Economic analysis of employment, earnings, and the labor market; labor relations; related government policies. Prerequisite: ECON 002
ECON 323 (GS) PUBLIC FINANCE (3) Contemporary fiscal institutions in the United States; public expenditures; public revenues; incidence of major tax types; intergovernmental fiscal relations; public credit. Prerequisite: ECON 002
ECON 333 (GS) INTERNATIONAL ECONOMICS (3) Why nations trade, barriers to trade, balance of payments adjustment and exchange rate determination, eurocurrency markets, and trade-related institutions. Prerequisite: ECON 002, ECON 004, or ECON 014
ECON 342 (GS) INDUSTRIAL ORGANIZATION (3) Industrial concentration, size, and efficiency of business firms, market structure and performance, competitive behavior, public policy and antitrust issues. Prerequisite: ECON 002

ECON 351 MONEY AND BANKING (3) Money, credit, commercial and central banking, financial intermediaries, treasury operations, monetary theory and policy, and foreign exchange. Students who have already taken Econ. 451 may not schedule this course. Prerequisite: ECON 002 or ECON 004

ECON 370 (GS) COMPARATIVE ECONOMIC DEVELOPMENT (3) Problems of growth and development in non-industrialized countries and in economies in transition; institutions and economic development. Prerequisite: ECON 002 or ECON 014

ECON 372 (GS) TRANSITION TO MARKET ECONOMIES (3) Economics of transition to a market economy; problems of former Soviet-type economies; privatization, stabilization, and institutional change. Prerequisite: ECON 002 or ECON 014

ECON 390 STATISTICAL FOUNDATIONS FOR ECONOMETRICS (3) Basic statistical concepts used in economics. Topics include probability distributions, expectations, estimation, hypothesis testing, correlation, and simple regression. Students who have completed ECON 490 may not schedule this course. Prerequisite: MATH 110, STAT 200

ECON 395 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor

ECON 399 (GI) FOREIGN STUDIES (1–12)

ECON 400M HONORS SEMINAR IN ECONOMICS (3–12) Readings, discussion, and oral and written reports on selected topics in economics. Prerequisite: ECON 302, ECON 304, fifth-semester standing, admission into Honors program

ECON 401 HISTORY OF ECONOMIC THOUGHT (3) Survey of economic ideas from Greco-Roman times to the present. Prerequisite: ECON 302 or ECON 304

ECON 402 DECISION MAKING AND STRATEGY IN ECONOMICS (3) Development and application of the tools for decision making under uncertainty and for game theoretic analysis of economic problems. Prerequisite: ECON 302; MS&IS 200 or STAT 200

ECON 404 CURRENT ECONOMIC ISSUES (3) An analytical survey of significant problems of current economic policy and the application of economic analysis to important social issues. Prerequisite: ECON 302 or ECON 304

ECON 404W CURRENT ECONOMIC ISSUES (3) An analytical survey of significant problems of current economic policy and the application of economic analysis to important social issues. Prerequisite: ECON 302 or ECON 304

ECON 405 SEMINAR IN ECONOMIC ANALYSIS (3) Development and application of tools of economic analysis; recent analytical developments; policy problems. Primarily for senior-year economics majors. Prerequisite: ECON 302, ECON 304

ECON 412 LABOR MARKET POLICY AND COLLECTIVE BARGAINING (3) Operation of and current problems in labor markets, collective bargaining, social insurance, income maintenance. Prerequisite: ECON 302 or ECON 315

ECON 423 STATE AND LOCAL TAXATION (3) Representative state and local tax systems, including analysis of state-local fiscal relationships and proposals for tax revision. Prerequisite: ECON 323

ECON 424 INCOME DISTRIBUTION (3) Inequality and poverty in the United States, measurement problems, determinants of inequality, arguments for and against equality, impact of redistributive policies. Prerequisite: ECON 302, ECON 315, or ECON 323

ECON 425 ECONOMICS OF PUBLIC EXPENDITURES (3) Analytic and policy aspects of public expenditure decisions; applications from areas of contemporary public interest. Prerequisite: ECON 302 OR ECON 323

ECON 427 (EDLDR) ECONOMICS OF EDUCATION (3) Theoretical and empirical concepts in economics applied to education. Prerequisite: ECON 302, ECON 315, or EDLDR 480

ECON 428 ENVIRONMENTAL ECONOMICS (3) Environmental pollution, the market economy, and optimal resource allocation; alternative control procedures; levels of environmental protection and public policy. Prerequisite: ECON 302 or ECON 323

ECON 429 PUBLIC FINANCE AND FISCAL POLICY (3) Analysis of public revenue and expenditure structure primarily at the federal level; federalism; fiscal policy and public debt. Prerequisite: ECON 323; ECON 302 or ECON 304

ECON 432 URBAN ECONOMICS (3) Theories and methods for economic analysis of such urban problems as housing, segregation, government services, and transportation. Prerequisite: ECON 302 or ECON 323

ECON 433 ADVANCED INTERNATIONAL TRADE THEORY AND POLICY (3) Causes/consequences of trade; effects of tariffs and quotas; strategic trade policy; political economy of trade restrictions and other topics. Prerequisite: ECON 302 OR ECON 333

ECON 434 INTERNATIONAL FINANCE AND OPEN ECONOMY MACROECONOMICS (3) Trade balance movements, exchange rate determination; monetary and fiscal policies in open economies; international policy coordination; the world monetary system. Prerequisite: ECON 304 OR ECON 333

ECON 435 BLACK AMERICAN ECONOMIC DEVELOPMENT (3) Analytical and theoretical aspects of Black American economic development: discrimination, development approaches, historical experience, public and private policies. Prerequisite: ECON 302 or ECON 304

ECON 436 (GI) ECONOMICS OF DISCRIMINATION (3) Analysis of the economic characteristics of women and minorities, with examination of race and sex discrimination and related government policies. Prerequisite: ECON 302 OR ECON 315

ECON 443 ECONOMICS OF LAW AND REGULATION (3) An economic analysis of property rights, contractual arrangements, illegal activities, and regulation; competitive problems due to externalities and market failure. Prerequisite: ECON 302 or ECON 342
ECON 444 ECONOMICS OF THE CORPORATION (3) Coordination and incentive issues within a corporation. Topics include employment contracts, performance incentives and pricing of financial assets. Prerequisite: ECON 302
ECON 445 (H P A) HEALTH ECONOMICS (3) Economic analysis of U.S. health care system; planning, organization, and financing; current public policy issues and alternatives. Prerequisite: ECON 302, ECON 315, or ECON 323
ECON 447 ECONOMICS OF SPORTS (3) Examination of economic issues pertaining to professional and collegiate sports, including analysis of industrial organization, labor markets, and local economies. Prerequisite: ECON 302
ECON 450 THE BUSINESS CYCLE (3) Measurement and theories of the business cycle; stabilization policies; forecasting. Prerequisite: ECON 304 OR ECON 351
ECON 451 MONETARY THEORY AND POLICY (3) Monetary and income theory; monetary and fiscal policy. Prerequisite: ECON 304 or ECON 351
ECON 462 AMERICAN ECONOMIC DEVELOPMENT (3) Quantitative aspects and theories of American economic development; resource and technological considerations; economic policies and growth. Prerequisite: ECON 302 or ECON 304
ECON 463 ECONOMIC DEMOGRAPHY (3) Microeconomics of demographic behavior; interrelationships between demographic and economic factors, in developing and industrialized economies; economic welfare and policy implications. Prerequisite: ECON 302 or ECON 304; or 9 credits in demography
ECON 471 GROWTH AND DEVELOPMENT (3) Problems of capital formation, institutional considerations, theories of economic growth. Prerequisite: ECON 302 or ECON 304 or ECON 370 or ECON 372
ECON 474 EAST ASIAN ECONOMIES (3) Development, structure, and policies of the economies of East Asian pacific rim nations. Prerequisite: EA ST 187 OR ECON 370; ECON 002 OR ECON 004
ECON 480 MATHEMATICAL ECONOMICS (3) Mathematical techniques employed in economic analysis; formal development of economic relationships. Prerequisite: ECON 302, ECON 304, MATH 110
ECON 489M HONORS THESIS (1–6) Prerequisite: ECON 302, ECON 304, admission into the departmental Honors program
ECON 490 INTRODUCTION TO ECONOMETRICS (3) Use of simple and multiple regression models in measuring and testing economic relationships. Problems including multicollinearity, hetroskedasticity, and serial correlation. Prerequisite: MATH 110, ECON 390
ECON 494 RESEARCH PROJECT (1–12)
ECON 495 INTERNSHIP (1–18)
ECON 496 INDEPENDENT STUDIES (1–18)
ECON 497 SPECIAL TOPICS (1–9)
ECON 499 (GI) FOREIGN STUDY—ECONOMICS (2–6) Study in selected countries of economic institutions and current economic problems. Prerequisite: ECON 002, ECON 004

EDUCATION (ED)

College of Education

ED 100S FIRST-YEAR SEMINAR IN EDUCATION (3) Learning about a scholarly community through the development of knowledge and skills needed for successful participation in higher education.
ED 197 SPECIAL TOPICS (1–9)
ED 294, 494 RESEARCH PROJECT (1–12)

EDUCATION (EDUC)

Capital College

EDUC 302 BASIC PREPARATION FOR TEACHING (3) Philosophical, psychological issues in education; instructional objectives, lesson planning; evaluation, grading procedures; assessment, instruction of individual children. Field experience. Prerequisite: admission into Elementary Education Major
EDUC 303 SENSITIVITY TO SPECIAL LEARNERS (3) This course is designed to examine the procedures, characteristics and strategies for working with special learners in the elementary school. Prerequisite: seventh-semester standing in Elementary Education Major
EDUC 304 CLASSROOM ORGANIZATION AND MANAGEMENT (3) Organization, integration of the elementary school day; classroom management, control techniques; audio-visual techniques. Prerequisite: sixth-semester standing in Elementary Education Major
EDUC 305 CREATIVE ARTS (3) Experiences in self-expression through a variety of artistic media. Techniques for guiding children in artistic expression. Prerequisite: admission into Elementary Education Major
EDUC 313 FIELD OBSERVATION (2) Observation techniques; classroom observation and participation. Prerequisite: admission into Secondary Teacher Certification Program. Prerequisite or concurrent: EDUC 314
EDUC 314 LEARNING THEORY AND INSTRUCTIONAL PROCEDURES (3) Theories of learning in relation to instructional practices. Analysis of motivation, transfer of learning, and retention. Field practicum. Prerequisite: admission into Secondary Teacher Certification Program. Prerequisite or concurrent: EDUC 313

EDUC 315 (GI) SOCIAL AND CULTURAL FACTORS IN EDUCATION (3) Critical examination of how different experiences linked to race, ethnicity, religion, gender, and sexual orientation influence education. Prerequisite: admission into Elementary Education Major or Secondary Teacher Certification Program
EDUC 320 METHODS IN TEACHING BEGINNING READERS (3) Concepts, methods, and materials for developing beginning reading abilities, with emphasis on personalized instruction through diagnostic teaching. Prerequisite: sixth-semester standing in Elementary Education Major
EDUC 321 METHODS IN TEACHING INTERMEDIATE AND ADVANCED READERS (3) Concepts, methods, and materials for personalizing reading instruction with emphasis on extending personal and functional reading abilities beyond beginning reading. Prerequisite: EDUC 320
EDUC 322 ADOLESCENT LITERATURE AND DEVELOPMENTAL READING (3) Adolescent literature materials, reading principles, and practices suitable for an English class. Prerequisite: admission into Secondary English Certification Program
EDUC 331 INTRODUCTION TO EARLY CHILDHOOD EDUCATION (1) Introduction to the elements of an early childhood program.
EDUC 352 TEACHING LANGUAGE ARTS (3) Teaching the writing process, including speaking and listening skills in relation to oral and written composition. Prerequisite: sixth-semester standing in Elementary Education Major
EDUC 353 TEACHING ELEMENTARY SOCIAL STUDIES (3) The theory and practice of elementary social studies instruction. Prerequisite: seventh-semester standing in Elementary Education Major
EDUC 371 TEACHING MUSIC IN THE ELEMENTARY SCHOOL (3) Music methods course for elementary education majors; students will learn elements of music, and instructional techniques. Prerequisite: seventh-semester standing in Elementary Education Major
EDUC 385 PROFESSIONAL DEVELOPMENT IN TEACHING (3) This course addresses practical issues central to the profession of teaching and, in some cases, specific to Pennsylvania. Prerequisite: eight-semester standing, approval of program
EDUC 401 EARLY CHILDHOOD EDUCATION (3) Organization, methodology, and materials for nursery school and kindergarten programs.
EDUC 402 LANGUAGE DEVELOPMENT, SELF-EXPRESSION, AND LITERATURE IN EARLY CHILDHOOD EDU CATION (3) Examining the development of language and self-expression in young children, and the role of children's literature in facilitating development.
EDUC 403 CURRICULUM FOR EARLY CHILDHOOD (3) Examining early childhood programs and methodology, focusing on areas of social studies, mathematics, and science.
EDUC 404 YOUNG CHILDREN'S BEHAVIOR: OBSERVATION AND EVALUATION (3) Observation, recording and evaluation of student behaviors, and the use of prescription techniques for early childhood students with special needs.
EDUC 405 EARLY CHILDHOOD EDUCATION: INFANCY AND TODDLERHOOD (3) Models of infant development with focus on the first three years of life—cognitive, socio-emotional milestones, will be analyzed.
EDUC 406 HUMAN SEXUALITY (3) Examination of physiology, diseases, attitudes, morality, and controversial topics related to sexuality. Consideration of sex eduction in the school curriculum.
EDUC 408 ADMINISTRATION OF EARLY CHILDHOOD EDUCATION PROGRAMS (3) The role of the early childhood administrator as it relates to regulations, staffing, management, funding and curriculum. Prerequisite: EDUC 401
EDUC 410 THE CHILD AND SOCIAL INSTITUTIONS (3) The effects of the family on a child's development, especially in the infancy and preschool years.
EDUC 412 EARLY LITERACY INTERVENTION I (3) Participants will better understand factors affecting early reading behavior through diagnostic techniques, observation techniques, and literacy intervention strategies. Prerequisite: permission of the program
EDUC 413 EARLY LITERACY INTERVENTION II (3) Participants will continue to learn skills, knowledge, and experience processes to implement the early literacy intervention program. Prerequisite: EDUC 412
EDUC 415 TEACHING SECONDARY SOCIAL STUDIES (3) Study of the objectives, content, methods, and evaluation of procedures of social studies. Students design units and lesson plans. Prerequisite: EDUC 314, EDUC 315, and admission into Secondary Social Studies Certification Program
EDUC 416 TEACHING SECONDARY ENGLISH AND THE HUMANITIES (3) Study of the objectives, content, and methods of English and humanities courses. Prerequisite: EDUC 314, EDUC 315, and admission into Secondary English Certification Program
EDUC 417 TEACHING SECONDARY MATHEMATICS (3) Study of the objectives, content, methods, and evaluation procedures of mathematics. Prerequisite: EDUC 314, EDUC 315, and admission into Secondary Mathematics Certification Program
EDUC 418 POSITIVE CLASSROOM CLIMATE FOR POSITIVE ATTITUDES ABOUT LEARNING (3) Participants will learn strategies for creating classroom climates which encourage positive attitudes toward learning while preventing and correcting student misbehavior. Prerequisite: PERMISSION OF PROGRAM
EDUC 421 CHILDREN'S LITERATURE (3) Knowledge of literature appropriate for elementary school children and utilization of literature-related activities in teaching reading. Prerequisite: admission into Elementary Education Major
EDUC 422 LITERATURE FOR CHILDREN AND ADOLESCENTS (4) Literature for children and adolescents, approaches for using such literature in the school curriculum.
EDUC 424 FOLK AND FAIRY TALES (3) In this course students will examine the social and psychological

significance of folk tales, make cross-cultural comparisons, and study story grammars of these stories. Prerequisite: 6 credits in humanities
EDUC 425 LITERACY ASSESSMENT (3) This course emphasizes alternative literacy measures focusing on portfolio assessment and performance assessments. Prerequisite: permission of the program
EDUC 435 ADDRESSING THE NEEDS OF SPECIAL LEARNERS (1) An examination of attitudes toward, barriers experienced by, and special needs of special learners in the schools. Prerequisite: eighth-semester standing in Secondary Teacher Certification Program
EDUC 436 INCLUSION PRACTICES IN EDUCATION (3) The educational, social, and political foundations for inclusion practices in public education. Prerequisite: permission of program
EDUC 440 EDUCATIONAL STATISTICS AND MEASUREMENTS (3) Descriptive statistics, correlation, reliability, validity, scaling techniques, and introduction to item analysis.
EDUC 450 CURRENT TOPICS IN EDUCATION (1–15)
EDUC 452 TEACHING WRITING (3) Techniques for teaching the writing process, kindergarten through grade 12, including writing in content areas; workshop format.
EDUC 460 FIELD STUDY IN ECOLOGY (4) Study and analysis of the ecology of various regions of the world. May be repeated for credit. Prerequisite: EDSCI 454
EDUC 462 COMPUTERS FOR CLASSROOM TEACHERS (3) An introduction: microcomputers and their educational applications. Prerequisite: admission into Elementary Education Major
EDUC 463 THE INTERNET AND K-12 EDUCATION (3) Relates educational theory and practice to applications of the Internet, applying content from educational foundations, curriculum, and research. Prerequisite: EDUC 462 or approval of program.
EDUC 464 TECHNOLOGY AND THE LEARNING PROCESS (3) Evaluates the relationship between technology-based resources and learning theories through design, implementation, and evaluation of online instructional modules. Prerequisite: EDUC 462 or EDUC 463 or permission of program
EDUC 470 HIGHER-ORDER THINKING FOR EDUCATORS (3) Presentation of strategies, techniques, and principles of higher-order thinking which are grounded in relevant research and practice will be presented. Prerequisite: admission into Elementary Education Major
EDUC 471 BEST PRACTICES IN LITERACY (3) An application of best literacy practices to classroom instruction and assessment of reading, writing, listening, and speaking. Prerequisite: EDUC 320 or EDUC 321
EDUC 472 TEACHING READING THROUGH THE CONTENT AREAS (3) Designed to enable teachers of content areas to improve the reading/study skills needed by their students.
EDUC 474 ADVANCED WHOLE LANGUAGE (3) To support and encourage educators teaching in whole language classrooms with emphasis on strategies and processes relevant to all. Prerequisite: EDUC 471
EDUC 476 THE EFFECTS OF ENVIRONMENT ON CHILD DEVELOPMENT (3) The effects of environmental forces such as mother's anxiety during the prenatal period and culture on childhood and adolescence.
EDUC 484 SCHOOL LAW FOR TEACHERS (3) This course will focus on increasing teacher awareness of law and how it impacts on daily performance and job security. Prerequisite: permission of program
EDUC 490 STUDENT TEACHING (1–12) Observation and teaching in selected elementary or secondary schools under direction of cooperating classroom teachers and University supervisors. Regular seminars. GPA 3.0 or higher. Passing scores on required Praxis I tests. Prerequisite: eight semester standing, approval of program
EDUC 494 RESEARCH PROJECT (1–12)
EDUC 495 INTERNSHIP (1–15) Supervised off-campus, non-group instruction including individual field experiences, practicums or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
EDUC 495A JUNIOR FIELD EXPERIENCE (1) Second semester juniors assigned to a suburban elementary school for the purpose of actively participating in classroom activities. Prerequisite: prior approval of proposed placement by instructor.
EDUC 495B SENIOR FIELD EXPERIENCE (1) First semester seniors assigned to an urban elementary school for the purpose of actively participating in classroom activities. Prerequisite: prior approval of proposed placement by instructor.
EDUC 495C EARLY CHILDHOOD FIELD EXPERIENCE (1) First semester seniors assigned to an urban elementary school for the purpose of actively participating in an early childhood classroom. Prerequisite: prior approval of proposed placement by instructor and completion of all four early childhood prerequisite courses.
EDUC 496 INDEPENDENT STUDIES (1–18)
EDUC 497 SPECIAL TOPICS (1–9)
EDUC 498 SPECIAL TOPICS (1–9)

EDUCATION MATHEMATICS (EDMTH)

Capital College

EDMTH 301 MATHEMATICS IN ELEMENTARY EDUCATION I (3) Survey of content, pedagogy, and psychology of mathematics instruction for pre-school through third grade. Emphasis on a concrete approach to instruction. Prerequisite: a previous course in college mathematics and formal admission into the Teacher Certification Program
EDMTH 302 MATHEMATICS IN ELEMENTARY EDUCATION II (3) Survey of content, pedagogy, and

psychology of mathematics instruction for grades 4 through 8. Emphasis on a concrete approach to instruction. Prerequisite: EDMTH 301
EDMTH 420 MATHEMATICS IN THE CLASSROOM (3) Examination of interactions in the secondary mathematics classroom. This course will build directly upon student teaching experiences. Prerequisite: EDUC 417, EDUC 490
EDMTH 432 DIAGNOSTIC AND PRESCRIPTIVE MATHEMATICS: BASIC PRINCIPLES (3) Examination of the basic principles of diagnostic and prescriptive mathematics for elementary and secondary teachers.
EDMTH 433 DIAGNOSTIC AND PRESCRIPTIVE MATHEMATICS: CLASSROOM APPLICATIONS (3) The application of the diagnostic and prescriptive skills of DP Math in a practical setting and administering a laboratory program. Prerequisite: EDMTH 432
EDMTH 455 CURRENT ISSUES IN MATHEMATICS EDUCATION (3) An examination and analysis of contemporary trends and concerns in the teaching of mathematics. Prerequisite: EDMTH 302 or EDUC 417
EDMTH 497 SPECIAL TOPICS (1–9)

EDUCATION SCIENCE (EDSCI)

Capital College
EDSCI 454 MODERN ELEMENTARY SCIENCE EDUCATION (3) Introduction of content, methods, and materials used in modern elementary science with emphasis upon modern elementary science programs. Prerequisite: 6 credits in biological and/or physical science
EDSCI 497 SPECIAL TOPICS (1–9)

EDUCATIONAL ADMINISTRATION (EDADM)

College of Education
EDADM 427 (ECON) ECONOMICS OF EDUCATION (3) An investigation of the theoretical and empirical aspects of investment in education and other human resources areas. Prerequisite: ECON 302 or ECON 315 or EDADM 480
EDADM 476 THE TEACHER AND THE LAW (3) An introduction to education law as it affects the teacher. Prerequisite: 9 credits in education or the social sciences
EDADM 480 INTRODUCTION TO EDUCATIONAL ADMINISTRATION (2–3) Development of educational administration. Relationships among local, state, and federal agencies. Introduction to current concepts and theories. Prerequisite: 3 credits in social science, sociology, anthropology, community development, business administration or political science
EDADM 481 COLLECTIVE BARGAINING IN EDUCATION (3) Analysis of public bargaining, including history, development of legislation, analysis of current laws, and strategies and techniques, including simulated bargaining. Prerequisite: teaching experience or EDADM 480
EDADM 485 PRINCIPAL AS INSTRUCTIONAL LEADER (3) Knowledge and skills principals need to lead instructional design and implementation. Prerequisite: EDADM 480
EDADM 498 SPECIAL TOPICS (1–9)

EDUCATIONAL PSYCHOLOGY (EDPSY)

College of Education
EDPSY 010 (GS) INDIVIDUAL DIFFERENCES AND EDUCATION (3) Relationships between learner differences and physical, cognitive, language, social, and cultural development; emphasis on ethnicity, gender, special needs; schooling implications.
EDPSY 014 LEARNING AND INSTRUCTION (3) Psychology of human learning applied toward the achievement of educational goals; evaluation of learning outcomes.
EDPSY 101 (GQ) ANALYSIS AND INTERPRETATION OF STATISTICAL DATA IN EDUCATION (3) An introduction to quantitative methods in educational research emphasizing the interpretation of frequently encountered statistical procedures.
EDPSY 296, 496 INDEPENDENT STUDIES (1–18)
EDPSY 297, 497, 498 SPECIAL TOPICS (1–9)
EDPSY 400 INTRODUCTION TO STATISTICS IN EDUCATIONAL RESEARCH (3) The foundations of statistical techniques used in educational research; distributions, central tendency, variability, correlation, regression, probability, sampling, hypothesis testing.
EDPSY 406 APPLIED STATISTICAL INFERENCE FOR THE BEHAVIORAL SCIENCES (3) Common techniques (parametric) covered through two-factor analysis of variance (independent samples); hypothesis testing, confidence interval, power, robustness; MINITAB frequently used. Prerequisite: EDPSY 400 or STAT 200
EDPSY 421 LEARNING PROCESSES IN RELATION TO EDUCATIONAL PRACTICES (3) An introduction to the empirical study of variables and conditions that influence school learning. Prerequisite: EDPSY 014 or PSY 213
EDPSY 450 (PSY) PRINCIPLES OF MEASUREMENT (3) Scale transformation, norms, standardization, validation procedures, estimation of reliability. Prerequisite: EDPSY 400 or PSY 015 or PSY 002; STAT 200
EDPSY 475 INTRODUCTION TO EDUCATIONAL RESEARCH (3) Scientific method; classes of variables in educational research; the measurement of classroom behavior; survey, predictive, and experimental studies. Prerequisite: EDPSY 400

EDUCATIONAL THEORY AND POLICY (EDTHP)

College of Education

EDTHP 115 EDUCATION IN AMERICAN SOCIETY (3) Introduction to the development of educational institutions, with emphasis on historical, philosophical, and sociological forces, and on problems of equity.

EDTHP 115A (GS) COMPETING RIGHTS: ISSUES IN AMERICAN EDUCATION (3) An examination of educational issues relevant to democratic citizenship; emphasis is on understanding the relationship among politics, schools, and society.

EDTHP 297 SPECIAL TOPICS (1–9)

EDTHP 401 INTRODUCTION TO COMPARATIVE EDUCATION (3) Origins, nature, scope, basic literature, and methodology of comparative education. Study of sample topics.

EDTHP 404 EDUCATION IN AFRICA (3) Major emphasis upon educational philosophies, policies, and programs in African nations south of the Sahara.

EDTHP 405 EDUCATION IN ASIA (3) A comparative analysis of educational structures and processes in Asian societies.

EDTHP 406 EDUCATION IN EUROPE (3) Studies of contemporary educational policy and practice in Western European societies.

EDTHP 407 EDUCATION IN LATIN AMERICA AND THE CARIBBEAN (3) Studies of educational and social progress of the Latin American and Caribbean countries.

EDTHP 411 ETHNIC MINORITIES AND SCHOOLS IN THE UNITED STATES (3) Analysis of the social and cultural factors which affect educational outcomes among minority pupils, especially blacks, Hispanics, and Indians.

EDTHP 412 (WMNST) EDUCATION AND THE STATUS OF WOMEN (3) An examination of the relationship of education to the status of women in American society.

EDTHP 416 (SOC) SOCIOLOGY OF EDUCATION (3) The theoretical, conceptual, and descriptive contributions of sociology to education.

EDTHP 430 HISTORY OF EDUCATION IN THE UNITED STATES (3) American educational ideas and practice critically examined in terms of their historical development and contemporary significance.

EDTHP 440 INTRODUCTION TO PHILOSOPHY OF EDUCATION (3) Introduction to the examination of educational theory and practice from philosophical perspectives, classical and contemporary. Prerequisite: EDTHP 115

EDTHP 441 EDUCATION, SCHOOLING, AND VALUES (3) Studies in education and schooling as problems in value; axiological problems and positions; examination of practical applications, including moral education.

EDTHP 496 INDIVIDUAL STUDIES (1–18) Creative projects supervised on an individual basis and which fall outside the scope of formal courses.

EDTHP 497 SPECIAL TOPICS (1–9)

EDTHP 498 SPECIAL TOPICS (1–9)

ELECTRICAL ENGINEERING (E E)

College of Engineering

E E 007S ADVENTURES IN ELECTRICAL ENGINEERING (1) Exploration of electrical engineering through several hands-on activities that cover a broad spectrum of applications and fundamental concepts.

E E 008S INTRODUCTION TO DIGITAL MUSIC (1) First-year seminar that discusses digital music from an electrical engineering perspective; topics include sampling, digital filtering, compression, and music synthesis.

E E 010S FIRST-YEAR SEMINAR IN ELECTRICAL ENGINEERING (1) First-year seminar covering a variety of Electrical Engineering topics that vary from year to year.

E E 097 SPECIAL TOPICS (1–9)

E E 203 PRINCIPLES OF ELECTRICAL ENGINEERING (4) Fundamental treatment of circuits and fields in electrical engineering, with emphasis on the pertinent laws and theorems. Intended for students in engineering science. Prerequisite: MATH 231; PHYS 202 or PHYS 212

E E 210 CIRCUITS AND DEVICES (4) Introduction to electrical circuit analysis, electronic devices, amplifiers, and time-domain transient analysis. Prerequisite: PHYS 202 or PHYS 212. Prerequisite or concurrent: MATH 250

E E 220 ELECTRICAL CIRCUITS AND POWER DISTRIBUTION (3) D.C. and A.C. circuits, transformers, single and three-phase distribution systems, A.C. motors and generators. Prerequisite: PHYS 202 or PHYS 212

E E 296 INDEPENDENT STUDIES (1–18)

E E 297 SPECIAL TOPICS (1–9)

E E 305 INTRODUCTION TO ELECTRONIC MEASURING SYSTEMS (3) Electronic devices and characteristics, amplifiers and feedback, electronic instruments and recording systems. Designed for non-electrical engineering students. Prerequisite: PHYS 202 or PHYS 212

E E 310 ELECTRONIC CIRCUIT DESIGN I (4) Properties of fundamental electronic devices, analysis of DC, AC small-signal and nonlinear behavior, analog and digital circuit design applications. Prerequisite: E E 210

E E 311 ELECTRONIC CIRCUIT DESIGN II (3) Electronic circuit design with consideration to single and multi-device subcircuits, frequency response characteristics, feedback, stability, efficiency, and IC techniques. Prerequisite: E E 310, E E 350

E E 317 SIGNALS AND SYSTEMS: CONTINUOUS AND DISCRETE-TIME (3) Fourier series and Fourier transform; discrete-time signals and systems and their Fourier analysis; sampling; z-transform. Prerequisite: CMPSC 201C or CMPSC 201F; E E 210, MATH 250

E E 320 INTRODUCTION TO ELECTRO-OPTICAL ENGINEERING (3) An introduction covering several fundamental areas of modern optics, optical processes, and devices. Prerequisite: E E 330

E E 324 INTRODUCTION TO EMBEDDED MICROCONTROLLERS (3) Introduction to microcontrollers in electronic and electromechanical systems. Hardware and software design for user/system interfaces, data acquisition and control. Prerequisite: CMPSC 201C or CMPSC 201F; CSE 271, E E 310

E E 330 ENGINEERING ELECTROMAGNETICS (4) Static electric and magnetic fields; solutions to static field problems, Maxwell's equations; electromagnetic waves; boundary conditions; engineering applications. Prerequisite: E E 210; MATH 230 or MATH 232

E E 340 ELECTRONIC DEVICES AND CIRCUITS (3) Theoretical study of electronic devices, active and passive circuit elements, linear and nonlinear active circuit analysis. Intended for students in engineering science. Prerequisite: E E 203 or E E 210

E E 350 CONTINUOUS-TIME LINEAR SYSTEMS (4) Introduction to continuous-time linear system theory: differential equation models, sinusoidal steady-state analysis, convolution, Laplace transform and Fourier analysis. Prerequisite: E E 210, MATH 220, MATH 250

E E 351 DISCRETE-TIME LINEAR SYSTEMS (3) Introduction to discrete-time signal processing: sampling, linear time- invariant systems, discrete-time Fourier transform and discrete Fourier transform, Z transform. Prerequisite: E E 350

E E 365 ENERGY CONVERSION (3) Electromechanical energy conversion; magnetic circuits; transformers; steadystate and transient analysis of induction, synchronous, and dc machines. Prerequisite: E E 350

E E 367 COMMUNICATIONS SYSTEMS I (3) Generic communication system; signal transmission; digital communication systems; amplitude modulation; angle modulation. Prerequisite: E E 350

E E 396H INDEPENDENT STUDIES (1–4) Prerequisite: junior standing

E E 397 SPECIAL TOPICS (1–9)

E E 402W SENIOR PROJECT DESIGN IN ELECTROMAGNETICS (3) Project designs of antenna and microwave systems, with an emphasis on technical communications skills. Lab. Prerequisite: E E 330. Prerequisite or concurrent: ENGL 202C

E E 403W SENIOR PROJECT DESIGN (3) Project designs of electrical engineering systems, encompassing various subdisciplines within Electrical Engineering, with an emphasis on technical communications skills. Prerequisite: E E 324, E E 330, E E 350, and the completion of two Electrical Engineering technical electives. Prerequisite or concurrent: ENGL 202C

E E 411 PRINCIPLES OF ELECTROMAGNETIC FIELDS (3) Laws of electrodynamics, boundary value problems, relativistic effects, waves in dielectrics and ferrites, diffraction and equivalence theorems. Prerequisite: E E 330

E E 412 OPTICAL FIBER COMMUNICATIONS (3) Operational principles of optical components, including sources, fibers and detectors, and the whole systems in optical fiber communications. Prerequisite: E E 320, E E 350, E SC 314

E E 413 LINEAR NETWORK ANALYSIS (3) Generalized linear network analysis; positive real concepts; 1-port networks; 2-element kind networks; equivalent networks; n-port networks; parts of network functions. Prerequisite: E E 350

E E 414 PRINCIPLES AND APPLICATIONS OF LASERS (3) Principles of lasers—generation, propagation, detection and modulation; applications in fiber optics communication, remote sensing, holography, optical switching and processing. Prerequisite: E E 330, E SC 400H, or PHYS 400

E E 417 SYSTEM THEORY (3) Signal and system models in electrical engineering, response of systems, system stability, reliability, network flow models. Prerequisite: E E 367

E E 418 SOLID STATE DEVICE TECHNOLOGY (3) The fundamentals of device technology, including oxidation, diffusion, photoresist, metallization, epitaxy, and material preparation. Prerequisite: E E 310, E SC 314

E E 419 SOLID STATE DEVICES (3) The physics of semiconductors as related to the characteristics and design of solid state electronic devices. Prerequisite: E E 310, E SC 314

E E 420 ELECTRO-OPTICS: PRINCIPLES AND DEVICES (3) Spatially linear system and transform; diffraction theory, partial coherence theory, optical image detection, storage and display, holography. Prerequisite: E E 320

E E 422 OPTICAL ENGINEERING LABORATORY (3) Hands-on experience covering areas of optical transforms, electro-optics devices, signal processing, fiber optics transmission, and holography. Prerequisite: E E 320

E E 423 POWER ELECTRONICS (3) Switch-mode electrical power converters. Electrical characteristics and thermal limits of semiconductor switches. Prerequisite: E E 310, E E 350

E E 425 SYMMETRICAL COMPONENTS (3) Application of the method of symmetrical components to analysis of unbalanced polyphase circuits, including rotating machinery under unbalanced conditions and unsymmetrical faults on power systems. Prerequisite: E E 365

E E 428 LINEAR CONTROL SYSTEMS (3) State variables; time-domain and frequency-domain design and analysis; design of feedback control systems; Root Locus. Prerequisite: E E 310, E E 350

E E 429 INTRODUCTION TO DIGITAL CONTROL SYSTEMS (3) Sampling and hold operations; A/D and D/A conversions; modeling of digital systems; response evaluation; stability; basis of digital control; examples. Prerequisite: E E 351, E E 428

E E 432 UHF AND MICROWAVE ENGINEERING (3) Transmission line and wave guide characteristics and components; design of UHF-microwave amplifiers, oscillators, and filters; measurement techniques; design projects. Prerequisite: E E 310, E E 330

E E 433 (METEO) FUNDAMENTALS OF REMOTE SENSING SYSTEMS (3) The review of fundamental

physical properties leads into discussions of various techniques, including imaging, spectroscopy, radiometry, and active sensing. Prerequisite: E E 330 or METEO 436
E E 438 ANTENNA ENGINEERING (3) Radiation from small antennas, linear antenna characteristics, arrays of antennas, impedance concepts and measurements, multifrequency antennas, and aperture antennas. Prerequisite: E E 330
E E 439 RADIOWAVE PROPAGATION IN COMMUNICATIONS (3) Radiowave propagation phenomena and problems encountered in practice; effects of the earth and atmosphere on radiowaves. Prerequisite: E E 330
E E 447 (CSE) DIGITAL INTEGRATED CIRCUITS (3) Analyses and design of digital integrated circuit building blocks, including logic gates, flip-flops, memory elements, analog switches, multiplexers, and converters. Prerequisite: E E 310
E E 448 LINEAR ELECTRONIC DESIGN (3) Linear circuit design via integrated circuit processes; A/D converters, switched capacitor filters, phase lock loops, multipliers, and voltage- controlled oscillators. Prerequisite: E E 311
E E 453 FUNDAMENTALS OF DIGITAL SIGNAL PROCESSING (3) Design of FIR and IIR filters; DFT and its computation via FFT; applications of DFT; filter implementation; finite arithmetic effects. Prerequisite: E E 317 or E E 351
E E 456 (E SC;EGEE) INTRODUCTION TO NEURAL NETWORKS (3) Artificial Neural Networks as a solving tool for difficult problems for which conventional methods are not applicable. Prerequisite: CMPSC 201C or CMPSC 201F; MATH 220
E E 458 (CSE) COMMUNICATION NETWORKS (3) Data transmission, encoding, link control techniques; communication network architecture, design; computer communication system architecture, protocols. Prerequisite: CSE 271; E E 317 or E E 350
E E 459 COMMUNICATION SYSTEMS II (3) Probability fundamentals, digital/analog modulation/demodulation, system noise analysis, SNR and BER calculations, optimal receiver design concepts, introductory information theory. Prerequisite: E E 367
E E 461 FUNDAMENTALS OF POWER SYSTEM STABILITY (3) Power systems, system fault calculations, fault currents and voltages, application of stability equipment, differential protection, stability instrumentation. Prerequisite: E E 365
E E 478 (CSE) DIGITAL DESIGN USING FIELD PROGRAMMABLE DEVICES (3) Field programmable device architectures and technologies; rapid prototyping using top down design techniques; quick response systems. Prerequisite: CSE 331
E E 485 (CSE) AN INTRODUCTION TO DIGITAL IMAGE PROCESSING (3) Overview of digital image processing techniques and their applications; image sampling, enhancement, restoration, and analysis; computer projects. Prerequisite: E E 317 or E E 350; CMPSC 201C or CSE 103
E E 486 (CSE) FUNDAMENTALS OF COMPUTER VISION (3) Introduction to topics such as image formation, segmentation, feature extraction, shape recovery, object recognition, and dynamic scene analysis. Prerequisite: MATH 230 or MATH 231; CMPSC 201C or CSE 103
E E 490 (AERSP;NUC E) INTRODUCTION TO PLASMAS (3) Plasma oscillations; collisional phenomena; transport properties; orbit theory; typical electric discharge phenomena. Prerequisite: E E 330 or PHYS 467
E E 492 (AERSP) SPACE ASTRONOMY AND INTRODUCTION TO SPACE SCIENCE (3) The physical nature of the objects in the solar system; the earth's atmosphere, ionosphere, radiation belts, magnetosphere, and orbital mechanics. Prerequisite: E E 330 or PHYS 400
E E 494 SENIOR THESIS (1–9) Students must have approval of a thesis adviser before scheduling this course.
E E 496 INDEPENDENT STUDIES (1–18)
E E 497 SPECIAL TOPICS (1–9)

ELECTRICAL ENGINEERING (E ENG)

Capital College

E ENG 317 SIGNALS AND SYSTEMS: CONTINUOUS AND DISCRETE-TIME (4) Transient response, frequency response, Bode plots, resonance, filters, Laplace transform, Fourier series and transform, discrete-time signals/ systems; sampling z-transform. Prerequisite: E ENG 354
E ENG 352 SIGNALS AND CIRCUITS II (3) Complex frequency; frequency response, Bode diagrams; magnetically coupled circuits, power transformers; two-port networks; Laplace transforms, circuit applications; Polyphase circuits. Prerequisite: CMPSC 201C or CMPSC 201F; E E 251
E ENG 354 ELECTRICAL CIRCUITS AND SIGNALS (5) Introduction to circuits, signals, energy, circuit analysis; frequency response, Bode diagrams, two-port networks; Laplace transforms, Polyphase circuits. Prerequisite: or concurrent: MA SC 440 or MATH 250
E ENG 355 ELECTRICAL CIRCUITS LABORATORY (2) Properties of electrical circuits, devices and components: design and testing of electrical circuits and systems. Concurrent: E ENG 354
E ENG 361 ENGINEERING ELECTROMAGNETICS (4) Maxwell's equations in free space and matter; static and quasi-static electric and magnetic fields; steady state currents; energy; forces. Prerequisite: E ENG 354; MA SC 450 or MATH 230
E ENG 368 INTRODUCTION TO ELECTRONIC DEVICES AND CIRCUITS (4) Linear and nonlinear applications of devices, discrete, and integrated. Prerequisite: E ENG 354
E ENG 370 ELECTRONIC CIRCUIT DESIGN (4) Electronic device models, biasing, small-signal operation, frequency response characteristics, power amplifiers, feedback, oscillators. Prerequisite: E ENG 354, E ENG 368

E ENG 417 LINEAR SYSTEMS: TIME DOMAIN AND TRANSFORM ANALYSIS (3) Signals and systems representations, classifications, and analysis using; Difference and Differential equations, Laplace transform, z-transform, Fourier series, FT, FFT, DFT. Prerequisite: graduate standing
E ENG 421 INTRODUCTION TO AUTOMATION AND ROBOTICS SYSTEMS (3) Emphasis on systems building blocks, control, actuators, sensors, programming PLC'S, and vision. Prerequisite: E ENG 433
E ENG 422 ENERGY SYSTEMS AND CONVERSION (3) Overview of energy alternatives available, and study of theory of operation and models of major energy conversion devices. Prerequisite: E ENG 354, MATH 250
E ENG 430 ELECTRONIC MATERIALS SCIENCE (3) Quantitative description of properties and behavior of materials with application to integrated circuits, photonic devices, and quantum well devices. Prerequisite: MATH 141; MA SC 422 or STAT 200
E ENG 433 CONTROL SYSTEMS (4) Classical/modern approaches to system analysis/design; time/frequency domain modeling, stability, response, optimization, and compensation. Prerequisite: E ENG 317, E MCH 011, PHYS 211
E ENG 441 CONTROL SYSTEM DESIGN (3) Analysis and design of automatic control systems using time, frequency domain and state variable methods. Prerequisite: E ENG 433
E ENG 442 CAPSTONE PROPOSAL PREPARATION (1) Performing the initial research needed for the capstone course, and the preparation of the written project proposal. Prerequisite: senior level standing
E ENG 443W ELECTRICAL ENGINEERING CAPSTONE DESIGN (3) Project designs of analog and digital systems, interfacing, and relevant electronic circuits, with an emphasis on technical communications skills. Prerequisite: E ENG 368, E ENG 468, E ENG 442 and ENGL 202C
E ENG 455 DIGITAL IMAGE PROCESSING AND COMPUTER VISION (3) Principles of DSP and computer vision, including sensing preprocessing, segmentation, description, recognition, and interpretation. Prerequisite: E ENG 317
E ENG 460 POWER SYSTEMS ANALYSIS I (3) Real and reactive power control; graph theory and network matrices for power systems, power-flow analysis, optimum operating strategies, computer algorithms. Prerequisite: E ENG 317
E ENG 463 POWER ELECTRONICS (3) Programmable logic controllers, specialized DC motors, encoders, AC motors and control devices, transducers, optoelectric devices, and process control. Prerequisite: E ENG 354, E ENG 368
E ENG 467 COMMUNICATIONS I (4) Element of analog and digital communication systems, AM, FM, and digital modulation techniques, receivers, transmitters, and transmission systems, noise. Prerequisite: E ENG 317
E ENG 468 ELECTRONIC CIRCUIT DESIGN II (3) Intermediate level course in analog electronic circuit design, with emphasis on frequency response, feedback, and stability. Prerequisite: E ENG 368
E ENG 470 POWER SYSTEMS ANALYSIS II (3) Power flow studies; symmetrical components and computer applications for unbalanced faults; computer analysis of transient stability for multimachine systems. Prerequisite: E ENG 460

ELECTRICAL ENGINEERING (EE BD)

Penn State Erie, The Behrend College
EE BD 097 SPECIAL TOPICS (1–9)
EE BD 197 SPECIAL TOPICS (1–9)
EE BD 295 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
EE BD 296 INDEPENDENT STUDIES (1–18)
EE BD 297 SPECIAL TOPICS (1–9)
EE BD 317 PHYSICAL AND SOLID STATE ELECTRONICS (3) Concepts of relationships between structural, electrical, and magnetic properties of conductors, semi-conductors, and insulators; principle of semiconducting, magnetic, and dielectric devices materials. Prerequisite: EE BD 251
EE BD 322 ELECTRICAL CIRCUIT ANALYSIS (3) Circuit analysis techniques; mutual inductance; frequency response; FOURIER series; LAPLACE transform. Prerequisite: CMPSC 201C or CMPSC 201F; E E 251. Prerequisite or concurrent: E E 255
EE BD 323 ELECTROMAGNETIC FIELDS AND WAVES (3) Electromagnetic field theory and applications; Maxwell's equations; plane wave propagation; boundary conditions; basic antenna theory; impedance matching. Prerequisite: E E 210, MATH 230
EE BD 324 MICROELECTRONICS I (4) Introduction to nonlinear circuit elements; operation, design and analysis of digital circuits at the transistor level. Prerequisite: E E 210
EE BD 325 DESIGN OF SWITCHING SYSTEMS (4) Fundamentals of switching logic and combinational circuits. Minimization techniques. Logic and electronic design of functional digital units. Introduction to sequential circuits. Prerequisite: CMPSC 201C or CMPSC 201F; MATH 141
EE BD 326 SIGNALS AND SYSTEMS (4) Continuous and discrete linear systems analysis; Laplace and Fourier transform analysis; introduction to analog and digital signal processing. Prerequisite: E E 210, EE BD 324
EE BD 327 SIGNALS AND CONTROLS LABORATORY (1) Design, computer simulation, and practical implementation of systems in the areas of filtering, digital signal processing, and controls. Concurrent: EE BD 326, EE BD 410

EE BD 395 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
EE BD 410 CONTROL SYSTEMS (3) Introduction to control of mechanical and electrical systems; mathematical modeling; performance and design of control systems; stability; root loci; modern control. Prerequisite: EE BD 322, MATH 220. Prerequisite or concurrent: EE BD 326
EE BD 415 DIGITAL CONTROL SYSTEMS (3) Analysis and synthesis of sampled data control systems; state space control; stability tests; PID controllers; digital control systems design techniques. Prerequisite: EE BD 410 OR ME BD 329
EE BD 420 MEASUREMENTS AND INSTRUMENTATION (3) Measurement concepts, electro-mechanical transducers, applied electrical and mechanical measurements, electrical and electronics instruments, data acquisition, instrumentation systems, probability theory and error analysis. Prerequisite: EE BD 324, EE BD 325, EE BD 410
EE BD 421 (CENBD) MICROPROCESSORS (3) Microprocessor architecture; memory system design; assembly language programming; interrupts; the stacks and subroutines; memory and I/O inter- facing; serial I/O and data communications; microprocessors applications. Prerequisite: EE BD 325
EE BD 422 ADVANCED MICROPROCESSORS (3) Programmable LSI ports; DMA; interfacing convertors (A/D and D/A); trends in microprocessor technology and bus standards; multiple microprocessor systems. Prerequisite: EE BD 421
EE BD 425W MICROELECTRONICS II (4) Design/analysis of electronics circuits including: single/multistage transistor amplifiers, op amp circuits, feedback amplifiers, filters, A/D and D/A converters. Prerequisite: EE BD 324
EE BD 427 COMMUNICATIONS SYSTEMS (3) Communication systems such as commercial broadcasting and telephone with emphasis on signal design and modulation. Prerequisite: EE BD 326 Concurrent: STABD 303
EE BD 431 ELECTROMAGNETIC ENERGY CONVERSION (3) Electromechanical energy conversion; transformers; direct and alternating current rotating machines. Prerequisite: EE BD 322
EE BD 433 POWER SYSTEMS (3) Power distribution and transmission systems, modeling, network calculations, load flow studies, and system protection. Prerequisite: EE BD 431
EE BD 460 ADVANCED POWER SYSTEMS (3) Review of circuits and motors; lighting; protection of electric systems; control circuits; design of feeders; transformer applications; use of national electric code. Prerequisite: EE BD 433
EE BD 462 POWER ELECTRONICS (3) Diode circuits and rectifiers; thyristor circuits for controlled rectifiers; AC and DC voltage controllers; inverters; power supplies; AC and DC motor control. Prerequisite: EE BD 431
EE BD 471 SIGNAL AND IMAGE PROCESSING (3) Linear system analysis in one-dimension and two-dimensions, emphasis on filtering; multi-dimensional signal analysis; image enhancement and reconstruction; computer simulation applications. Prerequisite: EE BD 326
EE BD 473 DIGITAL SIGNAL PROCESSING (3) Discrete-time signals and systems; filter design techniques; adaptive filters; spectral estimation; stationary and nonstationary signals. Prerequisite: EE BD 326
EE BD 480 ENGINEERING DESIGN CONCEPTS (3) Engineering design and modelling, engineering economy, project planning, capstone project selection, and technical communication skills. Prerequisite: EE BD 326, EE BD 410, EE BD 421, EE BD 425, SEVENTH-SEMESTER STANDING
EE BD 481 ELECTRICAL DESIGN PROJECTS (3) Group design projects in the areas of electronics and electrical/computer systems. Prerequisite: EE BD 480, eighth-semester standing
EE BD 494 RESEARCH PROJECT (1–12)
EE BD 495 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
EE BD 496 INDEPENDENT STUUDIES (1–18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
EE BD 497 SPECIAL TOPICS (1–9)

ELECTRICAL ENGINEERING TECHNOLOGY (E E T)

Capital College

E E T 201 APPLIED ELECTRICITY (3) Electric and magnetic circuits; qualitative analysis of A.C. and D.C. machinery; introduction to electronic devices and circuits. Prerequisite: CMATH 221 or MATH 141; PHYS 151 or PHYS 212
E E T 211 INTRODUCTORY ELECTRICAL CIRCUITS (5) Conduction; basic circuit theory applied to D.C. and A.C. circuits containing basic resistance, inductance, and capacitance; magnetic circuits. Prerequisite: CMATH 221 or MATH 141; PHYS 151 or PHYS 212
E E T 221 ELECTRICAL INSTRUMENTATION (5) Theory and applications of modern electric and electronic instruments. Prerequisite: CMATH 221 or MATH 141; PHYS 151 or PHYS 212
E E T 222 ENERGY CONVERSION (4) Principles of A.C. and D.C. machinery and magnetic devices with applications. Prerequisite: E ENG 354, E ENG 355
E E T 231 ELECTRONICS (5) Electrical conduction in gases and solids; emission, diodes; principles of semiconductor, vacuum, and gaseous electronic devices; rectification and power control. Concurrent: E ENG 354, E ENG 355

E E T 310 CIRCUIT ANALYSIS PROBLEM SOLVING (1) A problem solving course to accompany E E T 211 and 311. May be required for some students. Concurrent: E E T 311 or E ENG 354

E E T 311 ALTERNATING CURRENT CIRCUITS (4) Circuit analysis including controlled sources, op amps, and ideal transformers, and calculus relationships; one/two port network models; three- phase and industrial loads. Prerequisite: MATH 140 Concurrent: MATH 141

E E T 312 ELECTRIC TRANSIENTS (4) Applied differential equations; in-depth study of transient electricity using Laplace, Fourier transforms, and state-space methods; Bode plots and application. Prerequisite: E E T 311 or E ENG 354 Concurrent: CMATH 221 or MATH 141

E E T 319 FUNDAMENTALS OF ELECTRICITY (2) Introduction to D. C. electricity and magnetism. Prerequisite: or concurrent: M E T 320

E E T 320 INDUSTRIAL ELECTRICITY AND ELECTRONICS (4) Electrical and electronic technology for mechanical engineering technology students; emphasizes power utilization and control and electronic applications. Prerequisite: M E T 320

E E T 330 ELECTRONIC DESIGN (4) Analog/Digital and Digital/Analog Converters; advanced and nonlinear Op-Amp circuit design; noise analysis; Active Filters and Waveform Generators. Prerequisite: E E T 311 or E ENG 352 or (E ENG 354 and E ENG 355);(EE T 205 and EE T 210) or concurrent E ENG 368 Concurrent: E E T 312

E E T 397 SPECIAL TOPICS (1–9)

E E T 401 DESIGN OF AUTOMATIC CONTROL SYSTEMS (4) Design of feedback control systems and selected components. Nyquist Criterion, Nichols Charts; compensation. Prerequisite: E E T 433

E E T 402 HIGH-FREQUENCY CIRCUIT DESIGN (4) Electromagnetic theory as applied to the design of antennas, waveguides, and high-frequency components. Prerequisite: senior standing in Electrical Engineering Technology

E E T 403 SWITCHING CIRCUIT DESIGN (4) Analysis and design of advanced combinational and sequential circuits using IC logic devices and PLD's while promoting the use of software development tools. Prerequisite: CSE 271 or EE T 117; CSE 275 or EE T 120

E E T 407 ELECTRONIC CIRCUIT DESIGN (4) Principles and techniques in the art of electronic circuit design using modern devices including integrated circuits and field effect transistors. Prerequisite: E E T 330

E E T 408 COMMUNICATION SYSTEM DESIGN (4) Communication system principles including modulation techniques, encoding and decoding, noise, and elementary probability. Prerequisite: senior standing in Electrical Engineering Technology

E E T 409 POWER SYSTEM ANALYSIS I (4) Analysis and applications study of power utility electrical equipment such as: synchronous machines, transformers, capacitors and transmission lines. Prerequisite: senior standing in Electrical Engineering Technology

E E T 410 POWER SYSTEM ANALYSIS II (4) Principles of load studies, fault analysis, stability and protection of the public electrical power system. Prerequisite: senior standing in Electrical Engineering Technology

E E T 412 MICROCOMPUTERS (4) Design, architecture, programming, and interfacing of microprocessors, enhanced by lab experiments. Prerequisite: CSE 271 or EE T 117; CSE 275 or EE T 120

E E T 413 OPTOELECTRONICS (4) Principles and applications of optoelectronics including sources, detectors, imagers, transmitters, fiber optics, systems and integrated optics. Prerequisite: senior standing in Electrical Engineering Technology

E E T 414 BIOMEDICAL INSTRUMENTATION (4) Introduction to transducers and circuits used to detect and process medical physiological data with focus on cardiovascular and respiratory systems. Prerequisite: E E T 312, E E T 330

E E T 419 PROJECT PROPOSAL PREPARATION (1) Performing the initial research needed for the senior project course, and the preparation of the written project proposal. Prerequisite: senior standing

E E T 420W ELECTRICAL DESIGN PROJECT (3) Design, construction, and testing of a project either selected by the students with approval or assigned by the instructor. Prerequisite: E E T 312, E E T 419, E E T 431

E E T 422 ENERGY DESIGN FOR INDUSTRY (3) Three phase circuits, magnetic circuits, and design concepts to optimize industrial energy systems. Prerequisite: CMATH 221 or MATH 141; E E T 312

E E T 423 INDUSTRIAL ELECTRONICS (4) Power electronics design, phase shift and trigger circuits for PNPN devices, sensors, motor controls, interfacing digital devices to power electronics. Prerequisite: E E T 311, E E T 330

E E T 431 ADVANCED ELECTRONIC DESIGN (4) Applications of analog and digital integrated circuits; introduction to analog and digital communication techniques. Prerequisite: E E T 330

E E T 433 CONTROL SYSTEM ANALYSIS AND DESIGN (4) Classical and modern control analysis and design approaches, such as Laplace and state-space, aided by analog and digital computers. Prerequisite: E E T 312

E E T 456 AUTOMATION AND ROBOTICS (4) Introductory course in technologies of flexible automation and robotics systems. Studies include individual components, system building blocks, and complete systems. Prerequisite: E E T 403, E E T 431

E E T 478 DIGITAL COMMUNICATION SYSTEMS (4) Discrete signal analysis, A/D conversion, digital modulation techniques, encoding, decoding, data communication, noise. Prerequisite: E E T 403

E E T 497 SPECIAL TOPICS (1–9)

ELECTRICAL ENGINEERING TECHNOLOGY (EE T)

College of Engineering

EE T 100 APPLIED ELECTRICITY (3) AC and DC circuits; machinery; controls; and introduction to electronic devices, circuits, and instrumentation. Prerequisite: MATH 082, PHYS 151

EE T 101 ELECTRICAL CIRCUITS I (3) Fundamental theory of resistance, current, and voltage; capacitance, inductance. Direct current and alternating current concepts through series/ parallel circuits. Prerequisite: or concurrent: MATH 081

EE T 109 ELECTRICAL CIRCUITS LABORATORY I (1) Use of basic electrical instruments to measure AC and DC voltage, current, power, resistance. Introduction to report writing. Prerequisite: or concurrent: EE T 101

EE T 114 ELECTRICAL CIRCUITS II (4) Direct and alternating current circuit analysis including Thevenin and Norton Theorems, mesh, node analysis. Capacitance, inductance, resonance, power, polyphase circuits. Prerequisite: EE T 101, MATH 081

EE T 117 DIGITAL ELECTRONICS (3) Fundamentals of digital circuits, including logic circuits, boolean algebra, Karnaugh maps, counters, and registers. Prerequisite: EE T 101

EE T 118 ELECTRICAL CIRCUITS LABORATORY II (1) Continuation of EE T 109 with emphasis on student familiarization with basic electrical instruments and lab reporting. Prerequisite: EE T 109 Concurrent: EE T 114

EE T 120 DIGITAL ELECTRONICS LABORATORY (1) Laboratory study of digital electronics circuits. Prerequisite: EE T 109 Concurrent: EE T 117

EE T 197 SPECIAL TOPICS (1–9)

EE T 205 SEMICONDUCTOR LABORATORY (1) Laboratory study of semiconductor devices and circuits. Concurrent: EE T 210

EE T 210 FUNDAMENTALS OF SEMICONDUCTORS (2) Semiconductor and circuit theory including power supplies, amplifiers, power amplifiers, oscillators, and introduction to op-amps. Prerequisite: EE T 114, MATH 082

EE T 211 MICROPROCESSORS (3) A study of machine language programming, architecture, and interfacing for microprocessor-based systems emphasizing engineering applications. Prerequisite: EE T 117, EE T 120

EE T 213W FUNDAMENTALS OF ELECTRICAL MACHINES USING WRITING SKILLS (5) AC and DC machinery principles and applications; introduction to magnetic circuits, transformers, and electrical machines including laboratory applications. Prerequisite: EE T 114, EE T 118, ENGL 015

EE T 216 LINEAR ELECTRONIC CIRCUITS (3) Theoretical study of linear electronic devices and circuits, including field effect transistors, integrated circuits, and operational amplifiers. Prerequisite: EE T 210

EE T 220 PROGRAMMABLE LOGIC CONTROLLERS (2) An introduction to programmable logic controllers (PLCs); topics covered include programming, troubleshooting, networking, and industrial applications. Prerequisite: EE T 117 or EMET 310

EE T 221 LINEAR ELECTRONICS LABORATORY (1) Laboratory study of transistors; study of differential and operational amplifiers. Emphasis is placed on circuit design. Prerequisite: EE T 205 Concurrent: EE T 216

EE T 296 INDEPENDENT STUDIES (1–18)

EE T 297 SPECIAL TOPICS (1–9)

EE T 298 SPECIAL TOPICS (1–9)

ELECTRICAL ENGINEERING TECHNOLOGY (EETBD)

Penn State Erie, The Behrend College

EETBD 097 SPECIAL TOPICS (1–9)

EETBD 100 ELECTRIC CIRCUITS, POWER, AND ELECTRONICS (3) AC and DC circuits; machinery; controls; and introduction to electronic devices, circuits, and instrumentation. Prerequisite: MATH 040, MATH 082, MATH 140, or MTHBD 091; PHYS 151, PHYS 212, or PHYS 251

EETBD 197 SPECIAL TOPICS (1–9)

EETBD 275 INTRODUCTION TO PROGRAMMABLE LOGIC CONTROLS (3) Principles of industrial control, programming, interfacing, input/output devices, and applications. Prerequisite: EE T 205, EE T 221 Concurrent: EE T 221

EETBD 280 ELECTRONIC PROJECT DESIGN AND FABRICATION (3) Engineering drawings, material planning, printed circuits, enclosures, interconnection and cabling, environmental and human factors, codes and standards. Prerequisite: EE T 211. Prerequisite or concurrent: EE T 221

EETBD 296 INDEPENDENT STUDIES (1–18)

EETBD 297 SPECIAL TOPICS (1–9)

EETBD 301 ALGORITHMIC PROCESSES FOR ELECTRICAL SYSTEMS (3) Algorithms, languages, notations and applications of object- and procedure- oriented languages to electrical and electronic problem solving. Prerequisite: EE T 211 Concurrent: MATH 141 or MTHBD 210

EETBD 330 COMMUNICATION SYSTEMS (3) Analog communication systems; principles of AM and FM transmitters and receivers including sideband systems. Transmission lines, antenna theory, and noise calculations. Prerequisite: or concurrent: EETBD 415, MATH 250, or MTHBD 211

EETBD 341 MEASUREMENTS AND INSTRUMENTATION (3) Measurement concepts, transducers, electronic-aided measurement, mechanical and electrical measurements. Intended for electrical engineering technologists. Prerequisite: EE T 117, EE T 216. Prerequisite or concurrent: MATH 141 or MTHBD 210

EETBD 395 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.

EETBD 397 SPECIAL TOPICS (1–9)
EETBD 415 LINEAR SYSTEMS AND FUNDAMENTAL CONTROLS (3) Principles of linear systems and their control. Prerequisite: EETBD 301. Prerequisite or concurrent: MATH 250 or MTHBD 211
EETBD 416 FLUID AND THERMAL DESIGN IN ELECTRICAL SYSTEMS (3) Introduction to basic electrical engineering technology concepts and applications of thermodynamics, heat transfer, and fluid power in electrical/ electronic systems. Prerequisite: EETBD 415, MTHBD 211; or MATH 231, MATH 250
EETBD 430 FILTER THEORY (3) Analysis and synthesis of active and passive filters, including both analog and digital filters. Prerequisite: EETBD 415, MTHBD 211; or MATH 231, MATH 250
EETBD 437 ADVANCED COMMUNICATIONS, TELECOMMUNICATIONS (3) Telecommunication systems, telephone, television, data networks, computer networks, integrated voice and data. Prerequisite: EETBD 330, EETBD 455
EETBD 438 ADVANCED COMMUNICATIONS—MICROWAVE (3) Microwave communications techniques; Maxwell's equations, microwave components, use of s-parameters and impedance matching; applications of microwave systems. Prerequisite: EETBD 330, MTHBD 211; or MATH 231, MATH 250
EETBD 440 APPLIED FEEDBACK CONTROLS (3) Analysis and design of analog and digital feedback control systems. Prerequisite: EETBD 415, EETBD 455
EETBD 450 MANUFACTURING RELATED TOPICS IN ELECTRICAL SYSTEMS (3) Manufacturing methods, including reliability and quality control considera- tions as applied to electrical and electronic systems. Prerequisite: MTHBD 211; or MATH 231, MATH 250
EETBD 455 INTERMEDIATE MICROPROCESSORS AND MICROCOMPUTERS (3) Microprocessor architecture and assembly language programming. Hardware and software of basic microprocessors. Input/output structure in microcomputers. Prerequisite: EE T 221, EETBD 301, EETBD 341
EETBD 456 ADVANCED MICROPROCESSORS, HIGH LEVEL INTERFACING (3) Operating systems; systems programming; high-level application programming; high-level hardware and software protocols; serial and parallel digital communications. Prerequisite: EETBD 455
EETBD 457 SOFTWARE ENGINEERING (3) Application of modern techniques in software development, including program design based on new methods and tools. Prerequisite: EETBD 455
EETBD 458 DIGITAL SIGNAL PROCESSING (3) Continuous and discrete time signals, Fourier series and transform, z-transform, sampling, FIR and IIR filters, FFT, DFT, and applications. Prerequisite: EETBD 415, EETBD 455
EETBD 459 AUTOMATION AND ROBOTIC SYSTEMS (3) Programmable logic controllers, robot dynamics, programming, control, sensing, vision, and intelligence. Prerequisite: EETBD 330, EETBD 415, EETBD 455. Prerequisite or concurrent: EETBD 416, EETBD 440
EETBD 460 POWER SYSTEMS (3) Building power distribution and systems, equipment power systems, power components, power devices, motor control, power system design. Prerequisite: EE T 213W, EETBD 415, MTHBD 211; or MATH 231, MATH 250
EETBD 461 POWER ELECTRONICS (3) Fundamentals of power electronic circuits, semiconductor power devices, power conversion equipment. Circuit topologies, closed-loop control strategies, equipment design consideration. Prerequisite: EE T 213W, EE T 216, EETBD 415
EETBD 480 ELECTRICAL SYSTEMS SENIOR SEMINAR (1) Concepts of career development; project management; engineering design documentation; industrial design examples. Prerequisite: EETBD 330, EETBD 341, EETBD 455, ENGL 202C. Prerequisite or concurrent: ECON 002 or ECON 004
EETBD 490W ELECTRICAL/ELECTRONIC SENIOR DESIGN PROJECT (3) Individual or group design projects in electrical engineering technology. Prerequisite: EETBD 480. Prerequisite or concurrent: EETBD 450
EETBD 495 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experience, practica or internships. Written and oral critique of activity required. Prerequisite: PRIOR APPROVAL OF PROPOSED ASSIGNMENT BY INSTRUCTOR
EETBD 496 INDEPENDENT STUDIES (1–18)
EETBD 497 SPECIAL TOPICS (1–9)

ELECTRO-MECHANICAL ENGINEERING TECHNOLOGY (EMET)

College of Engineering, Berks-Lehigh Valley College

EMET 310 DIGITAL ELECTRONICS (3) Fundamentals of digital circuits including analysis and design of combinational and sequential logic circuits, multiplexers, demultiplexers, flip-flops, and counters. Prerequisite: EE T 101, EE T 109
EMET 311 SPATIAL ANALYSIS AND ADVANCED CAD (3) Spatial relations of points, lines, and solids with engineering applications; laboratory emphasis placed on CAD and parametric analysis. Prerequisite: EG T 101, EG T 102
EMET 320 ANALOG ELECTRONICS (4) Fundamentals of circuits using diodes, bipolar junction transistors, and other discrete electronic components; introduction to integrated circuits including op amps. Prerequisite: EE T 114; MATH 083 or MATH 140
EMET 321W ELECTRICAL MACHINES (4) Electro-mechanical energy conversion, AC and DC rotating machines, transformers, system protective devices, and solid state power control. Prerequisite: EE T 114
EMET 322 MECHANICS FOR TECHNOLOGY (4) Strength of materials and dynamics, including axial, shear, torsion, and bending stresses, beam deflection, kinematics and kinetics of rigid bodies. Prerequisite: MCH T 111; MATH 083 or MATH 140

EMET 330 MEASUREMENT THEORY AND INSTRUMENTATION (3) Fundamentals of measuring, transmitting, and recording temperature, pressure, flow, force, displacement, and velocity; laboratory component emphasizes systems used in manufacturing. Prerequisite: EMET 320 or EE T 216; and EMET 322 or M E T 206 Concurrent: MATH 250
EMET 350 QUALITY CONTROL, INSPECTION, AND DESIGN (3) Fundamentals of quality including statistics, probability, and design of experiments.
EMET 395 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
EMET 396, 496 INDEPENDENT STUDIES (1–18)
EMET 397, 497 SPECIAL TOPICS (1–9)
EMET 405 FLUID MECHANICS AND THERMODYNAMICS (4) Introduction to the principles of fluid mechanics, thermodynamics, and heat tranfer with emphasis on the applications to practical problems. Prerequisite: MATH 140, PHYS 150, MCH T 111
EMET 410 AUTOMATED CONTROL SYSTEMS (4) Introduction to analog feedback control theory and computer simulation and analysis using Matlab; laboratory study of feedback systems. Prerequisite: MATH 250, EMET 330, and EMET 321W or EE T 213W
EMET 420 COMMUNICATIONS SYSTEMS AND METHODS (3) Analog and digital communications systems including the study of analog modulation and digital encoding techniques, transmission systems, and communications networks. Prerequisite: EMET 310 or EE T 117; and EMET 230 or EE T 216
EMET 430 PROGRAMMABLE LOGIC CONTROLS II (3) A second course in PLCs covering sequencing/shift instructions, program flow control, data and math instructions, PID loops, and machine communication. Prerequisite: EE T 220
EMET 440 ELECTRO-MECHANICAL PROJECT DESIGN (3) Planning, development, and implementation of electro-mechanical design project; includes formal report writing, project documentation, group presentations, project demonstrations. Prerequisite: EMET 330; EMET 410; IE T 215; M E T 210W
EMET 495 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor

ENERGY, ENVIRONMENTAL, AND MINERAL ECONOMICS (ENNEC) *College of Earth and Mineral Sciences*

ENNEC 100 (GS) MINERALS AND RESOURCES AND THE GLOBAL COMMUNITY (3) Resource use decisions and their affect on the individual development and destinies of nations and groups; minerals in economic development and world history, in the global economy plus area studies.
ENNEC 297 SPECIAL TOPICS (1–9)
ENNEC 401 CASE STUDIES OF INDUSTRIAL ECOLOGY (1–3) The objective of this course is to introduce life cycle analysis and design for the environment. Prerequisite: junior or senior standing with background in earth and environmental studies
ENNEC 420 ECONOMICS OF NATURAL HAZARDS (3) Covers economic aspects of natural hazards: impacts, loss estimation, mitigation, recovery, modeling, policy analysis, risk, insurance, resiliency, and sustainability. Prerequisite: ECON 002
ENNEC 425 SIMULATION METHODS IN EARTH AND SOCIAL SCIENCES (3) This course will provide students with computer programming skills/ knowledge in statistics, stochastic process, and simulation applicable to earth/managerial sciences. Prerequisite: CMPSC 101, MATH 140
ENNEC 472 QUANTITATIVE ANALYSIS IN EARTH SCIENCES (3) Quantitative analysis of decision making in atmospheric/geophysical sciences: exploratory data analysis, quantification of uncertainty, parametric/non- parametric testing, forecasting, time series analysis. Prerequisite: MATH 110 or MATH 140
ENNEC 473 RISK MANAGEMENT IN ENERGY INDUSTRIES (3) Analysis of strategies for mitigating business risk from market, atmospheric, geophysical uncertainties including the use of energy/mineral commodity futures/options, weather derivatives, and insurance. Prerequisite: MSIS 200 or STAT 200 or ENNEC 472
ENNEC 482 ECONOMIC ANALYSIS OF MINERALS IN THE ENVIRONMENT (3) Economics of exploration and mining methods, future mineral availability, mineral and environmental law, mineral industries and the environment, current issues. Prerequisite: ECON 002, ENNEC 100
ENNEC 483 MATERIALS POLICY AND MARKETS (3) Integrated economic and institutional analysis of policy issues facing material markets, including recycling, pollution control, advanced materials, and industrial policy. Prerequisite: ECON 002, ENNEC 100
ENNEC 484W ENERGY ECONOMICS (3) Economics of energy demand, production, storage, and pricing; advanced energy policy issues including regulation, climate change, new energy technology. Prerequisite: ECON 002
ENNEC 490 APPLIED FINANCIAL AND INVESTMENT ANALYSIS (3) Valuation/investment analysis of mineral properties; commodity market analysis; introduction to principles of financial/investment analysis applied to natural resources/environment.
ENNEC 491 BUSINESS AND PUBLIC POLICY ANALYSIS (3) Capstone course integrating theory and empirical methods in the analysis of business and public policy. Prerequisite: 12 credits in ENNEC, ECON, AG EC, or BUS

ENNEC 492 ECONOMETRIC APPLICATIONS TO MINERAL MARKETS (3) Statistical tools as used by mineral economists, econometric models of mineral, material, and energy markets. Prerequisite: ECON 002, MATH 220, ECON 490 or STAT 451; 3 additional credits in economics or mineral economics
ENNEC 495 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practicums, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
ENNEC 496 INDEPENDENT STUDIES (1–18)
ENNEC 497 SPECIAL TOPICS (1–9)
ENNEC 499 (GI) FOREIGN STUDY—MINERAL INDUSTRIES (1–12) Courses offered in foreign countries by individual or group instruction.

ENERGY AND GEO-ENVIRONMENTAL ENGINEERING (EGEE)

College of Earth and Mineral Sciences
EGEE 101 (GN) (MATSC) ENERGY AND THE ENVIRONMENT (3) Energy utilization and technological development, energy resources, conversion and consequences on the local and global environment, and future energy alternatives.
EGEE 102 (GN) ENERGY CONSERVATION FOR ENVIRONMENTAL PROTECTION (3) Exposure to energy efficiency in day to day life to save money and energy, and thereby protect the environment.
EGEE 199, 299, 399, 499 (GI) FOREIGN STUDIES (1–12)
EGEE 211 (GS) SOCIAL LEGACY OF PENNSYLVANIA COAL (3) Survey of coal technologies with economic, social, and political impacts discussed with historical, cultural, and international perspectives.
EGEE 294, 494 RESEARCH PROJECT (1–12)
EGEE 295, 395, 495 INTERNSHIP (1–18)
EGEE 296, 496 INDEPENDENT STUDIES (1–18)
EGEE 301 THERMODYNAMICS AND FLUID MECHANICS (5) Treatment of fluid mechanics/thermodynamics targeted to needs of students in the Department of EGEE emphasizing common aspects between the two subjects. Prerequisite: MATH 141, PHYS 212
EGEE 397, 398, 497, 498 SPECIAL TOPICS (1–9)
EGEE 410 FUEL CELLS (3) The course covers an introduction to the fundamental principles of electrochemical engineering but focuses on design and applications of the main types of fuel cells. The laboratories on (1) electrochemical measurements and (2) polymer electrolyte fuel cell are scheduled in this course. Prerequisite: PHYS 212 and MATH 141
EGEE 456 (E E;E SC) INTRODUCTION TO NEURAL NETWORKS (3) Artificial Neural Networks as a solving tool for difficult problems for which conventional methods are not applicable. Prerequisite: CMPSC 201C or CMPSC 201F; MATH 220

ENGINEERING (ENGR)

College of Engineering
ENGR 097 SPECIAL TOPICS (1–9)
ENGR 100S INTRODUCTION TO ENGINEERING (1) A seminar providing information about different engineering majors, coping with college life, and exploring educational and career goals.
ENGR 195 ENGINEERING INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
ENGR 195A ENGINEERING INTERNSHIP (1 per semester, maximum of 4) A supervised work experience in a professionally relevant position in research, industry or government.
ENGR 195I ENGINEERING INTERNATIONAL INTERNSHIP (1–4 per semester) A supervised work experience in a professionally relevant position in research, industry or government.
ENGR 294 RESEARCH PROJECT COURSES (1–12)
ENGR 295 ENGINEERING CO-OP WORK EXPERIENCE I (1–3) A supervised work experience where the student is employed in an engineering position in industry or government. (To be offered only for SA/UN grading.) Prerequisite: CHEM 012, CSE 120, MATH 140, MATH 141, or PHYS 211
ENGR 295A ENGINEERING COOPERATIVE EDUCATION (1) A supervised work experience in research, industry or government relevant to a student's major.
ENGR 295I ENGINEERING INTERNATIONAL COOPERATIVE EDUCATION (1) A supervised work experience in research, industry or government relevant to a student's major.
ENGR 296 INDEPENDENT STUDIES (1–18)
ENGR 297 SPECIAL TOPICS (1–9)
ENGR 310 ENTREPRENEURIAL LEADERSHIP (3) This course develops leadership and entrepreneurial skills using collabora- tive, problem-based projects, with engineering and business students working in teams.
ENGR 395 ENGINEERING CO-OP WORK EXPERIENCE II (1–3) A supervised work experience where the student is employed in an engineering position in industry or government. (To be offered only for SA/UN grading.) Prerequisite: ENGR 295
ENGR 395A ENGINEERING COOPERATIVE EDUCATION (1–2 per semester) A supervised work experience in research, industry or government relevant to a student's major. Prerequisite: ENGR 295A or ENGR 295I

ENGR 395I ENGINEERING INTERNATIONAL COOPERATIVE EDUCATION (1–2 per semester) A supervised work experience in research, industry or government relevant to a student's major. Prerequisite: ENGR 295A or ENGR 295I
ENGR 407 TECHNOLOGY-BASED ENTREPRENEURSHIP (3) Technology innovation coupled with business planning and development. Prerequisite: ECON 002 or ECON 004
ENGR 408 LEADERSHIP PRINCIPLES (2) An introduction to an exploration of theories and principles of leadership, supplemented by presentations given by industry and government leaders.
ENGR 409 LEADERSHIP IN ORGANIZATIONS (3) Development of leadership skills essential for engineers to guide colleagues or an organization in a productive direction.
ENGR 411 ENTREPRENEURSHIP BUSINESS BASICS (3) Three critical entrepreneurship skills are covered for non-business majors: business finance, intellectual property, and marketing. Prerequisite: three credits in economics or economics-related course
ENGR 493 INDIVIDUAL LEADERSHIP EXPERIENCE (1) Approved individual project or internship for students to practice the leadership skills developed in the Engineering Leadership Development Minor. Prerequisite: ENGR 408, project approval by instructor
ENGR 494 RESEARCH PROJECT COURSES (1–12)
ENGR 495 ENGINEERING CO-OP WORK EXPERIENCE III (1–3) A supervised work experience where the student is employed in an engineering position in industry or government. (To be offered only for SA/Un grading.) Prerequisite: ENGR 395
ENGR 495A ENGINEERING COOPERATIVE EDUCATION (1–3 per semester) A supervised work experience in research, industry or government relevant to a student's major. Prerequisite: ENGR 395A or ENGR 395I
ENGR 495I ENGINEERING INTERNATIONAL COOPERATIVE EDUCATION (1–3 per semester) A supervised work experience in research, industry or government relevant to a student's major. Prerequisite: ENGR 395A or ENGR 395I
ENGR 496 INDEPENDENT STUDIES (1–18)
ENGR 497 SPECIAL TOPICS (1–9)

ENGINEERING DESIGN (EDSGN)

College of Engineering
EDSGN 294, 494 RESEARCH PROJECT (1–12)
EDSGN 295, 495 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
EDSGN 296, 496 INDEPENDENT STUDIES (1–18)
EDSGN 297, 497 SPECIAL TOPICS (1–9)
EDSGN 299, 499 FOREIGN STUDIES (1–12)

ENGINEERING DESIGN AND GRAPHICS (BDENG)

Penn State Erie, The Behrend College
BDENG 100S INTRODUCTION TO ENGINEERING DESIGN (3) Introduction to engineering design through team-oriented design projects supported by communications skills: graphical, verbal, written.
BDENG 296, 496 INDEPENDENT STUDIES (1–18 per semester)
BDENG 297, 497 SPECIAL TOPICS (1–9 per semester)

ENGINEERING DESIGN AND GRAPHICS (ED&G)

College of Engineering
ED&G 100 INTRODUCTION TO ENGINEERING DESIGN (3) Introduction to engineering design through team-oriented design projects supported by communication skills: graphical, verbal, written.
ED&G 100L INTRODUCTION TO ENGINEERING DESIGN (3) Introduction to engineering design through team-oriented design projects supported by communication skills: graphical, verbal, written.
ED&G 100P INTRODUCTION TO ENGINEERING DESIGN Introduction to engineering design through team-oriented design projects supported by communication skills: graphical, verbal, written.
ED&G 496 INDEPENDENT STUDIES (1–18)
ED&G 497 SPECIAL TOPICS (1–9)

ENGINEERING GRAPHICS (E G)

College of Engineering
E G 003 ARCHITECTURAL GRAPHICS (2) Principles of architectural drawing; spatial relationships of points, lines, planes, and solids with architectural applications; shadows, perspective, introduction to CAD.
E G 010 INTRODUCTORY ENGINEERING GRAPHICS (1) Multiview projections, pictorial drawings, dimensioning, engineering standards, and working drawings.
E G 030 ELEMENTARY COMPUTER GRAPHICS (2) Introduction to computer aided design (CAD) with emphasis on architectural applications and CAD features.
E G 097, 197, 297, 497 SPECIAL TOPICS (1–9)
E G 130 ARCHITECTURAL GRAPHICS AND CAD (3) Principles of architectural drawing; spatial relations with architectural applications; introduction to computer graphics (CAD) with project.

E G 296, 496 INDEPENDENT STUDIES (1–18)
E G 297, 298 SPECIAL TOPICS (1–9)

ENGINEERING GRAPHICS TECHNOLOGY (EG T)

College of Engineering

EG T 101 TECHNICAL DRAWING FUNDAMENTALS (1) Technical skills and drafting room practices; fundamentals of theoretical graphics; orthographic projection including sectional and auxiliary views; dimensioning.

EG T 102 INTRODUCTION TO COMPUTER-AIDED DRAFTING (1) A first course presenting an intensive study utilizing a computer assisted drafting and design system to obtain graphic solutions.

EG T 114 SPATIAL ANALYSIS AND COMPUTER-AIDED DRAFTING (2) Spatial relations of applications in engineering technology with more advanced functionality of computer-aided drafting and design systems. Prerequisite: EG T 101, EG T 102

EG T 201 ADVANCED COMPUTER AIDED DRAFTING (2) Application of the principles of engineering graphics; preparation of working drawings; details, examples, and bill of material using CAD. Prerequisite: EG T 101, EG T 102, EG T 114

EG T 297 SPECIAL TOPICS (1–9)

ENGINEERING MECHANICS (E MCH)

College of Engineering

E MCH 011STATICS (3) Equilibrium of coplanar force systems; analysis of frames and trusses; noncoplanar force systems; friction; centroids and moments of inertia. Prerequisite: or concurrent: MATH 141

E MCH 012 DYNAMICS (3) Motion of a particle; relative motion; kinetics of translation, rotation, and plane motion; work-energy; impulse-momentum. Prerequisite: E MCH 011 or E MCH 210; MATH 141

E MCH 013 STRENGTH OF MATERIALS (3) Axial stress and strain; torsion; stresses in beams; elastic curves and deflection of beams; combined stress; columns. Prerequisite: E MCH 011

E MCH 013D STRENGTH OF MATERIALS WITH DESIGN (3) Stress and deformation in members under axial, bending, and torsional loads, combined stress; columns. Design with a project. Prerequisite: E MCH 011, ED&G 100

E MCH 110H EQUILIBRIUM MECHANICS, HONORS (5) Equilibrium of particles and rigid bodies; stresses, strains, and displacements in elastic; rods, torsion bars, beams, trusses, frames, and columns. Prerequisite: or concurrent: MATH 141

E MCH 112H MECHANICS OF MOTION (3) Kinematics of a particle; relative motion; kinetics of a mass-point; kinetics of a rigid body; work-energy; impulse-momentum. Prerequisite: E MCH 011, E MCH 110H, or E MCH 210; MATH 141

E MCH 120S ADVENTURES IN MECHANICS—FIRST-YEAR SEMINAR (1) First-year seminar that introduces students to basic concepts in engineering mechanics.

E MCH 197 SPECIAL TOPICS (1–9)

E MCH 210 STATICS AND STRENGTH OF MATERIALS (5) Equilibrium of particles, rigid bodies, frames, trusses, beams, columns; stress and strain analysis of rods, beams, pressure vessels. Prerequisite: or concurrent: MATH 141

E MCH 215 MECHANICAL RESPONSE OF ENGINEERING MATERIALS (2) Mechanical response measures and design theories for engineering materials; elastic and plastic response as affected by stress, strain, time, temperature. Prerequisite: E MCH 013, E MCH 110H, or E MCH 210

E MCH 216 EXPERIMENTAL DETERMINATION OF MECHANICAL RESPONSE OF MATERIALS (1) Experimental techniques for mechanical property measurement and structural testing. Prerequisite: or concurrent: E MCH 215

E MCH 296 INDEPENDENT STUDIES (1–18 per semester).

E MCH 297 SPECIAL TOPICS (1–9)

E MCH 313 STATICS OF DEFORMABLE BODIES (3) Coplanar equilibrium; stress and strain. Elastic and inelastic response; applications to chemical processing equipment. Intended for students in chemical engineering. Prerequisite: CH E 302 or fifth-semester standing

E MCH 397 SPECIAL TOPICS (1–9)

E MCH 400 ADVANCED STRENGTH OF MATERIALS AND DESIGN (3) Combined stresses; energy methods; special problems in bending and torsion; plates; thin-walled structures; buckling and stability; design projects. Prerequisite: E MCH 013, E MCH 110H, or E MCH 210

E MCH 402 APPLIED AND EXPERIMENTAL STRESS ANALYSIS (3) Experimental design of structural and machine components; photoelasticity, electrical resistance strain gauge techniques, Moire techniques, interferometry, holography. Prerequisite: E MCH 013, E MCH 110H, or E MCH 210

E MCH 403 STRENGTH DESIGN IN MATERIALS AND STRUCTURES (4) Determination, interpretation, significance, and application of mechanical properties such as plastic flow, fatigue strength, creep resistance, and dynamic properties. Prerequisite: E MCH 215, E MCH 216

E MCH 407 COMPUTER METHODS IN ENGINEERING DESIGN (3) Computer methods in mechanical design: solid modeling, graphics, surface smoothing/interpolation and underlying numerics: simultaneous equations, quadrature, eigen problems, discrete models. Prerequisite: CMPSC 201C, CMPSC 201F, or E SC 261M; E MCH 013, E MCH 110H, or E MCH 210

E MCH 408 ELASTICITY AND ENGINEERING APPLICATIONS (3) General equation of stress and strain in rectangular, cylindrical, and spherical coordinates; applications in structural and machine design. Prerequisite: E MCH 013, E MCH 110H, or E MCH 210

E MCH 409 ADVANCED MECHANICS (3) Continuation of E MCH 012; Euler's equations for the rotation of a rigid body, gyroscopic motion, impulsive motion, Lagrangian mechanics. Prerequisite: E MCH 012 or E MCH 112H; MATH 230

E MCH 412 EXPERIMENTAL METHODS IN VIBRATIONS (3) Systems of one or more degrees of freedom, mechanical vibrations, vibration properties of materials, vibration techniques in nondestructive testing. Prerequisite: E MCH 454

E MCH 416H FAILURE AND FAILURE ANALYSIS OF SOLIDS (3) Examination and analysis of the various modes of failure of solid materials. Prerequisite: E MCH 013, E MCH 210, or E MCH 110H

E MCH 440 (MATSE) NONDESTRUCTIVE EVALUATION OF FLAWS (3) Methods and limitations of nondestructive evaluation of mechanical flaws; optical, acoustical, electromagnetic, x-ray, radiography, thermography, and dye techniques. Prerequisite: E MCH 013, E MCH 110H, OR E MCH 210

E MCH 446 MECHANICS OF VISCOELASTIC MATERIALS (3) Nature of viscoelastic materials, constitutive relations, thermorheological materials, viscoelastic stress analysis, rubber elasticity, viscoelastic liquids, experimental techniques for material characterization. Prerequisite: E MCH 215, E MCH 216

E MCH 454 (M E) ANALYSIS AND DESIGN IN VIBRATION ENGINEERING (3) Application of Lagrange's equations to mechanical system modeling, multiple- degree-of-freedom systems, experimental and computer methods; some emphasis on design applications. Prerequisite: E MCH 012 or E MCH 112H; M E 054 or E SC 407H

E MCH 461 (M E) APPLIED FINITE ELEMENT ANALYSIS (3) Computer modeling and fundamental analysis of solid, fluid, and heat flow problems using existing computer codes. Prerequisite: CMPSC 201C, CMPSC 201F, or E SC 261M; E MCH 013, E MCH 110H, or E MCH 210

E MCH 471 ENGINEERING COMPOSITE MATERIALS (3) Properties, manufacture, forms of composites; micromechanics; orthotropic lamina properties; laminate analysis; theories; failure analysis; thermal, environmental effects. Prerequisite: E MCH 013, E MCH 110H, or E MCH 210; E MCH 215, E SC 414M, or MATSE 201

E MCH 473 (AERSP) COMPOSITES PROCESSING (3) An introduction to the principles of mechanics governing manufacturing, computer-aided design, and testing of composite materials and structures. Prerequisite: E MCH 471

E MCH 496 INDEPENDENT STUDIES (1–18)

E MCH 497 SPECIAL TOPICS (1–9)

ENGINEERING SCIENCE (E SC)

College of Engineering

E SC 097 SPECIAL TOPICS (1–9)

E SC 120S DESIGN FOR FAILURE—FIRST-YEAR SEMINAR (1) This seminar, through the utilization of commonly used examples, discusses the engineering principles which are exploited by such designs.

E SC 121S SCIENCE/ENGINEERING FICTION AND THE ENGINEERING SCIENCES—FIRST-YEAR SEM INAR (1) Examines the technology predictions of authors in view of the engineering sciences on which the underlying devices of their stories are based.

E SC 122S WEIRD, WILD, AND WONDERFUL MATERIALS AND DEVICES—FIRST-YEAR SEMINAR (1) First-year seminar that surveys the use of novel materials and material systems to create practical devices.

E SC 123S CATASTROPHIC FAILURES—FIRST-YEAR SEMINAR (1) First-year seminar that explores design deficiencies through the study of case histories of a number of famous failures.

E SC 124S GREEN ENGINEERING—FIRST-YEAR SEMINAR (1) This First-year seminar introduces students to basic concepts in green engineering practices and processes.

E SC 130S SELECTED TOPICS IN ENGINEERING SCIENCE (1) Introduction to basic concepts of engineering practices, processes, and research across the engineering sciences.

E SC 197 SPECIAL TOPICS (1–9)

E SC 211 MATERIAL, SAFETY, AND EQUIPMENT OVERVIEW FOR NANOFABRICATION (3) Nanofabrication processing equipment and materials handling procedures with a focus on safety, environment, and health issues. Prerequisite: CHEM 011, MATH 081; PHYS 150 or PHYS 201

E SC 212 BASIC NANOFABRICATION PROCESSES (3) Step-by-step description of equipment and processes needed to nanofabricate bipolar transistors, CMOS transistors, power FETs, MEMS, chip structures. Concurrent: E SC 211

E SC 213 THIN FILMS IN NANOFABRICATION (3) Thin film deposition and etching practices in nanofabrication. Concurrent: E SC 211, E SC 212

E SC 214 LITHOGRAPHY FOR NANOFABRICATION (3) Lithographic process from substrate preparation to exposure; process from development through inspection; advanced optical lithographic techniques. Concurrent: E SC 211, E SC 212

E SC 215 MATERIALS MODIFICATION IN NANOFABRICATION (3) Processing steps used in modifying material properties in nanofabrication. Concurrent: E SC 211, E SC 212

E SC 216 CHARACTERIZATION, PACKAGING, AND TESTING OF NANOFABRICATED STRUCTURES (3) Measurements and techniques essential for controlling device fabrication. Concurrent: E SC 211, E SC 212

E SC 261M COMPUTATIONAL METHODS IN ENGINEERING (3) Modeling, solving engineering problems using FORTRAN, software libraries, graphics. Reports on root search, curve fitting, finite differences, algebraic equations. Prerequisite: or concurrent: MATH 141
E SC 296 INDEPENDENT STUDIES (1–18)
E SC 297 SPECIAL TOPICS (1–9)
E SC 314 ENGINEERING APPLICATIONS OF MATERIALS (3) Basic concepts of material structure and their relation to mechanical, thermal, electrical, magnetic, and optical properties, with engineering applications. Prerequisite: PHYS 212
E SC 397 SPECIAL TOPICS (1–9)
E SC 400H ELECTROMAGNETIC FIELDS (3) Irrotational and solenoidal fields, potentials, vector and scalar field and wave equations, harmonic and wave functions in various coordinates, radiation. Prerequisite: E E 210, MATH 250
E SC 404H ANALYSIS IN ENGINEERING SCIENCE (3) Unified application of coordinate transformations; Laplace's, heat, and wave equations to boundary value problems and problems of continua in engineering. Prerequisite: MATH 250 or MATH 251
E SC 405H ENGINEERING APPLICATIONS OF FIELD THEORY, HONORS (3) Field concepts in engineering, derivation of field equations, mathematical solutions, applications stressing universality of approaches to all fields of engineering. Prerequisite: MATH 250
E SC 406H ANALYSIS IN ENGINEERING SCIENCE II, HONORS (3) Application of complex variable theory, integral equations, and the calculus of variations to engineering problems. Prerequisite: E SC 404H
E SC 407H COMPUTER METHODS IN ENGINEERING SCIENCE, HONORS (3) Application of numerical methods to problems in engineering science. Algebraic and differential equations; integration; interpolation; eigenvalue problems; linear programming. Students who have passed E MCH 407 may not schedule this course for credit. Prerequisite: CMPSC 201C, CMPSC 201F, or E SC 261M. Prerequisite or concurrent: E MCH 012 or E MCH 112H
E SC 410H SENIOR DESIGN PROJECT, HONORS (3) Design and synthesis in the context of a specific design project undertaken during the senior year. Prerequisite: E SC 407H
E SC 411H SENIOR DESIGN PROJECT, HONORS (4) Design and synthesis in the context of a specific design project undertaken during the senior year. Prerequisite: E SC 410H
E SC 414M ELEMENTS OF MATERIAL ENGINEERING (3) Structure and imperfections in engineered materials; their influence on properties, behavior, and processing. Applications of metals, ceramics, polymers, and composites. Prerequisite: E MCH 013, E MCH 110H, or E MCH 210; PHYS 237
E SC 433H ENGINEERING SCIENCE RESEARCH LABORATORY EXPERIENCE (1) Student "hands-on" experiences spanning ESM Research laboratories: environmental degradation, fatigue, MEMS, neural networking, smart materials, ultrasonics, etc. Prerequisite: E E 203, E SC 414M
E SC 445 SEMICONDUCTOR OPTOELECTRONIC DEVICES (3) The course will present the basic engineering science and technology involved in modern semiconductor optoelectronic devices. Prerequisite: E E 340, E E 368, or E SC 314
E SC 450 (MATSE) SYNTHESIS AND PROCESSING OF ELECTRONIC AND PHOTONIC MATERIALS (3) The materials science of applying thin film coatings, etching, and bulk crystal growth; includes materials transport, accumulation, epitaxy, and defects. Prerequisite: CHEM 013, MATSE 400, MATSE 401, MATSE 402
E SC 455 (MATSE) ELECTROCHEMICAL METHODS IN CORROSION SCIENCE AND ENGINEERING (3) The objective of the course is to give students hands-on experience in assessing environmental degradation of engineering materials. Prerequisite: E SC 414M or MATSE 259; MATSE 420 or MATSE 421
E SC 456 (E E;EGEE) INTRODUCTION TO NEURAL NETWORKS (3) Artificial Neural Networks as a solving tool for difficult problems for which conventional methods are not available. Prerequisite: CMPSC 201C or CMPSC 201F; MATH 220
E SC 475 (MATSE) PARTICULATE MATERIALS PROCESSING (3) Fundamentals of processing particulate materials including production, characterization, handling, compaction, and sintering of metal, carbide, intermetallic, and composite powders. Prerequisite: E MCH 215, E SC 414, OR MATSE 259
E SC 481 ELEMENTS OF MICROELECTROMECHANICAL SYSTEMS PROCESSING AND DESIGN (3) Fundamentals and elements of microfabrication and micromachining. Design, process flow, and modeling for microelectromechanical devices. Prerequisite: E MCH 013; E MCH 215, E SC 314M, or E SC 414M; PHYS 203
E SC 494 SENIOR THESIS (1–9) Students must have approval of a thesis adviser before scheduling this course.
E SC 496 INDEPENDENT STUDIES (1–18)
E SC 497 SPECIAL TOPICS (1–9)

ENGINEERING TECHNOLOGY (E T)

Capital College

E T 200 GRAPHIC COMMUNICATIONS (3) The study of graphic communications relating to the design and construction industry. Prerequisite: 2-credit drafting course
E T 300 MECHANICS I: STATICS (2) Equilibrium of coplanar force systems; analysis of frames and trusses; shear and moment diagrams; friction; centroids and moment of inertia. Prerequisite: or concurrent: MATH 140, PHYS 001

E T 301 NEWTONIAN MECHANICS (4) Treatment of forces on rigid bodies at rest and in motion. Practical applications in electrical and mechanical systems. Prerequisite: or concurrent: MATH 140, PHYS 001
E T 302 MECHANICS II: DYNAMICS (2) Kinematics of a particle; relative motion; kinematics of a mass-point; kinematics of a rigid body; work-energy; impulse-momentum. Prerequisite: statics
E T 321 DYNAMICS (3) Motion of a particle, relative motion; kinetics of translation; rotation and plane motion; conservation of energy and momentum. Concurrent: statics, integral calculus
E T 322 STRENGTH OF MATERIALS (3) Axial, torsional, bending, and combined stress analysis; deformation and deflection analysis of cables, shafts, and beams; column design and analysis. Prerequisite: statics
E T 323 STRENGTH OF MATERIALS LABORATORY (1) Measurement of mechanical properties of materials, structural testing. Prerequisite: or concurrent: strength of materials
E T 324 VISUAL BASIC IN SCIENCE, ENGINEERING, AND TECHNOLOGY (3) Design, execution, debugging, and documentation of Visual Basic programming and applications in science, engineering, and technology. Prerequisite: junior standing or permission of program
E T 397 SPECIAL TOPICS (1–9)
E T 420 (DF) DESIGN FOR SOCIETY (3) An interdisciplinary study of the engineering design process and the influence of society and culture on design.
E T 420W (GI) DESIGN FOR SOCIETY (3) An interdisciplinary study of the engineering design process and the influence of society and culture on design. Prerequisite: ENGL 202
E T 451 ENVIRONMENTAL SANITATION (3) Epidemiology, toxicology, radiation health and safety, vector control, food protection, air, water and solid waste control, and environmental interrelationships. Prerequisite: seventh-semester standing
E T 495 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written or oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
E T 496 INDEPENDENT STUDIES (1–18)
E T 497 SPECIAL TOPICS (1–9)

ENGINEERING TECHNOLOGY (ET)

College of Engineering
ELOP 201 INDUSTRIAL APPLICATIONS OF LASERS (3) Introduction to principles of operation of lasers, properties, and propagation of laser beams, laser/material interactions and industrial applications of low/high power lasers. Prerequisite: PHYS 150
ELOP 202 SENSORS AND DETECTORS (3) Introduction to principles of operation of sensors and detectors. Prerequisite: PHYS 150
ELOP 203 INTRODUCTION TO ELECTRO-OPTICS (3) Introduction to electro-optics, properties and fabrication of materials in electro-optics.

ENGINEERING/LASER OPERATION (ELOP)

College of Engineering
ELOP 201 INDUSTRIAL APPLICATIONS OF LASERS (3) Introduction to principles of operation of lasers, properties, and propagation of laser beams, laser/material interactions and industrial applications of low/high power lasers. Prerequisite: PHYS 150
ELOP 202 SENSORS AND DETECTORS (3) Introduction to principles of operation of sensors and detectors. Prerequisite: PHYS 150
ELOP 203 INTRODUCTION TO ELECTRO-OPTICS (3) Introduction to electro-optics, properties and fabrication of materials in electro-optics.

ENGLISH (ELISH)

Penn State Erie, The Behrend College
ELISH 001 CREATIVE WRITING COMMON TIME (1–8) Required one hour a week meeting time; readings, professional development, advising, community-building.
ELISH 002 LITERARY MAGAZINE PRACTICUM (1 per semester, maximum of 8) A practicum in the editing and publishing of the student literary magazine TEMPUS.
ELISH 097, 197, 297, 397, 497, SPECIAL TOPICS (1–9)
ELISH 130 (GH) READING POPULAR TEXTS (3) Popular texts (printed, visual, and aural texts) and their social, political, and cultural significance in the contemporary world. Prerequisite: ENGL 015 or ENGL 030H
ELISH 201 CREATIVE WRITING (3 per semester, maximum of 6) An introductory course in creative writing for students interested in a variety of genres. Prerequisite: ENGL 015
ELISH 209 LITERARY JOURNALISM (3) Analysis and writing of nonfiction using techniques of fiction; writers such as Joan Didion, John McPhee, Tom Wolfe, and others. Prerequisite: ENGL 015 or ENGL 030
ELISH 296, 496 INDEPENDENT STUDIES (1–18)
ELISH 300 THE CANON AND ITS CRITICS (3) History and formation of literary canons, and challenges to canon ideology by writers and critics, through readings in English and American literature. Prerequisite: ENGL 015 or ENGL 030H
ELISH 301 GLOBALITY AND LITERATURE (3) Examines relationships between literature and culture, through the study of major texts in English by writers of various cultures. Prerequisite: ENGL 015 or ENGL 030H

ELISH 401 ADVANCED CREATIVE WRITING (3) An advanced course in creative writing for students interested in a variety of genres. Prerequisite: ELISH 201 or ENGL 212 or ENGL 213

ELISH 420 NONFICTION WORKSHOP (3) Advanced work in nonfiction through workshop. Prerequisite: ENGL 050 OR ENGL 212 OR ELISH 209 OR COMMU 201

ELISH 426 ADVANCED FICTION WRITING (3) Advanced workshop in fiction writing. Prerequisite: a grade of C or better required in ENGL 212

ELISH 427 ADVANCED POETRY WRITING (3) Advanced poetry writing, including prose poems; regular writing and revising of poetry; peer evaluation; group discussion. Prerequisite: a grade of C or better required in ENGL 213

ELISH 429W FICTION WORKSHOP (3–6 per semester) Advanced work in fiction writing through workshop and revision. Prerequisite: a grade of C or better required in ELISH 426

ELISH 430 ADVANCED POETRY WORKSHOP (3–6) Advanced workshop exercises leading to a chapbook; practice in metrical forms; discussion of schools, movements, themes; research on poet or issue. Prerequisite: a grade of C or better required in ELISH 427

ELISH 434 THE AMERICAN RENAISSANCE (3) Studies in the works and interrelationships of writers such as Emerson, Hawthorne, Poe, Thoreau, Whitman, and Dickinson. Prerequisite: ENGL 003; ENGL 015 OR ENGL 030

ELISH 440 THE AMERICAN NOVEL TO 1900 (3) Studies in the works of such writers ad Hawthorne, Melville, Twain, James, Crane, and others. Prerequisite: ENGL 003; ENGL 015 OR ENGL 030

ELISH 442 THE AMERICAN NOVEL: 1900-1945 (3) Studies in the works of such writers as Drieser, Cather, Fitzgerald, Hemingway, Barnes, Faulkner, and others. Prerequisite: ENGL 003; ENGL 015 OR ENGL 030

ELISH 447 MIDDLE ENGLISH LITERATURE (3) Major texts and authors in middle English such as Chaucer, Pearl Poet, mystery and morality plays, romances, lyrics. Prerequisite: ENGL 002; ENGL 015 OR ENGL 030

ELISH 448 SHAKESPEARE (3) Advanced comparative study of the writings of William Shakespeare, with emphasis on his recurring forms, themes, structure, and imagery. Prerequisite: ENGL 002; ENGL 015 OR ENGL 030

ELISH 461 ROMANTICISM (3) Readings in major authors, primarily British and American, who can be defined as "romantic," including British romantics and American transcentalists. Prerequisite: ENGL 002 OR ENGL 003; ENGL 015 OR ENGL 030

ELISH 475 THE VISIONARY IMAGINATION (3) Analysis of visionary texts that challenge relationships of humanity to traditional ideas of transcendence; examinations of literature as revisionary mythmaking. Prerequisite: ENGL 015 or ENGL 030H

ELISH 479 MILTON AND BLAKE (3) Study of major works by Milton and Blake; comparison of ideas; examination of poetry and prophecy in epic; study of influence. Prerequisite: ENGL 002 OR ENGL 167; ENGL 015 OR ENGL 030

ELISH 480 RHETORIC FOR BUSINESS (3) Rhetoric for business helps students improve their writing. Readings are "classics" which include a business theme. Prerequisite: ENGL 015; ENGL 202A or ENGL 202B or ENGL 202C or ENGL 202D

ELISH 481 TEACHING CHILDREN'S LITERATURE (3) Teaching Children's Literature in light of recent literary pedagogy, the history of childhood, and critical approaches to Children's Literature. Prerequisite: ENGL 202

ELISH 482W CONTEMPORARY LITERARY AND CULTURAL THEORY (3) Introduction to contempory literary and cultural theory, and application of that theory to both "high" and "popular" works of literature. Prerequisite: ENGL 015 or ENGL 030H; ENGL 200

ELISH 484W CREATIVE WRITING THEORY (3) Theories of art and creativity which inform the making of literary works. Prerequisite: ENGL 200; ELISH 201, ELISH 209, ENGL 212, or ENGL 213

ELISH 485 (GI) THE WORLD NOVEL IN ENGLISH (3) Studies in the novel, written in English, by writers outside of the United States and Great Britain. Prerequisite: ENGL 002; ENGL 015 OR ENGL 030

ELISH 487 (GI) WOMEN POETS (3) Study of major writings by women poets; instructor chooses emphasis, language, and period. Prerequisite: ENGL 002 OR ENGL 003 OR ENGL 167 OR ENGL 194; ENGL 015 OR ENGL 030

ELISH 488 AMERICAN FICTION SINCE 1945 (3) Studies in the fiction of such writers as Barth, Bellow, Carver, Erdrich, Morrison, O'Brien, O'Connor, Walker, and others. Prerequisite: ENGL 003; ENGL 015 OR ENGL 030

ELISH 489 LITERARY MODERNISM IN ENGLISH (3) Survey of literary modernism in English and English translation in a variety of genres, including poetry, fiction, and drama. Prerequisite: ENGL 015 or ENGL 030; ENGL 200, ELISH 300, or ELISH 301

ELISH 492 JAMES JOYCE (3) Analysis of principal works and their background. Prerequisite: ENGL 002; ENGL 015 OR ENGL 030

ELISH 494A SENIOR THESIS IN ENGLISH (1–6) Senior English (ELISH) majors write a thesis arranged with in-charge person and submit it to a faculty committee for appraisal. Prerequisite: seventh-semester standing

ELISH 495 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor

ENGLISH (ENGL)

College of the Liberal Arts

ENGL 001 (GH) UNDERSTANDING LITERATURE (3) Explores how major fiction, drama, and poetry, past and present, primarily English and American, clarify enduring human values and issues.

ENGL 001S (GH) UNDERSTANDING LITERATURE (3) Explores how major fiction, drama, and poetry, past and present, primarily English and American, clarify enduring human values and issues.

ENGL 001W (GH) UNDERSTANDING LITERATURE (3) Studies the various critical ways of reading, understanding, and writing about fiction, poetry, and drama.

ENGL 002 (GH) THE GREAT TRADITIONS IN ENGLISH LITERATURE (3) Major works of fiction, drama, and poetry from the Middle Ages to the twentieth century expressing enduring issues and values.

ENGL 003 (GH) THE GREAT TRADITIONS IN AMERICAN LITERATURE (3) Major works of fiction, drama, and poetry from the colonial to the modern periods expressing enduring issues and values.

ENGL 003S (GH) THE GREAT TRADITIONS IN AMERICAN LITERATURE (3) Major works of fiction, drama, and poetry from the colonial to the modern periods expressing enduring issues and values.

ENGL 004 BASIC WRITING SKILLS (3 per semester, maximum of 6) Intensive practice in writing sentences and paragraphs and instruction in grammar, usage, and punctuation. Designed for students with deficient preparation. This course may not be used to satisfy the basic minimum requirements for graduation in any baccalaureate degree program.

ENGL 005 WRITING TUTORIAL (1) Tutorial instruction in composition and rhetoric for students currently enrolled in Engl. 4 or 15. This course may not be used to satisfy the basic minimum requirements for graduation in any baccalaureate degree program.

ENGL 015 (GWS) RHETORIC AND COMPOSITION (3) Instruction and practice in writing expository prose that shows sensitivity to audience and purpose. Prerequisite: ENGL 004 or satisfactory performance on the English proficiency examination

ENGL 015S (GWS) RHETORIC AND COMPOSITION (3) Instruction and practice in writing expository prose that shows sensitivity to audience and purpose. Prerequisite: ENGL 004 or satisfactory performance on the English proficiency examination

ENGL 030 (GWS) HONORS FRESHMAN COMPOSITION (3) Writing practice for specially qualified and screened students. Students who have passed a special writing test will qualify for this course.

ENGL 030S (GWS) HONORS FRESHMAN COMPOSITION (3) Writing practice for specially qualified and screened students. Students who have passed a special writing test will qualify for this course.

ENGL 030T (GWS) HONORS FRESHMAN COMPOSITION (3) Writing practice for specially qualified and screened students. Students who have passed a special writing test will qualify for this course.

ENGL 050 (GA) INTRODUCTION TO CREATIVE WRITING (3) Practice and criticism in the reading, analysis and composition of fiction, nonfiction and poetry writing.

ENGL 083S (GH) FIRST-YEAR SEMINAR IN ENGLISH (3) Critical approaches to the dimensions and directions in English/American literature and rhetoric.

ENGL 088 (GH) AUSTRALIAN/NEW ZEALAND CULTURAL PERSPECTIVES (3) Australian and New Zealand cultural and social perspectives, with emphasis on the historical development of intellectual, aesthetic, and humanistic values.

ENGL 097, 197, 297, 397, 497 SPECIAL TOPICS (1–9)

ENGL 098, 198, 298, 398, 498 SPECIAL TOPICS (1–9)

ENGL 100 ENGLISH LANGUAGE ANALYSIS (3) An examination of English sounds, words, and syntax using traditional, structural, and transformational grammar.

ENGL 104 (GH) THE BIBLE AS LITERATURE (3) Study of the English Bible as a literary and cultural document.

ENGL 110 NEWSWRITING PRACTICUM (2 per semester, maximum of 6) Practice in writing and editing articles for the campus newspaper.

ENGL 129 (GH) SHAKESPEARE (3) A selection of the major plays studied to determine the sources of their permanent appeal. Intended for nonmajors.

ENGL 133 (GH) MODERN AMERICAN LITERATURE TO WORLD WAR II (3) Cather, Eliot, Frost, Faulkner, Fitzgerald, Hemingway, Hurston, Wharton, Wright, and other writers representative of the years between the world wars.

ENGL 134 (GH) AMERICAN COMEDY (3) Studies in American comedy and satire, including such writers as Mark Twain, Faulkner, Vonnegut, Ellison, O'Connor, Welty, and Heller.

ENGL 135 (GH;GI) ALTERNATIVE VOICES IN AMERICAN LITERATURE (3) United States writers from diverse backgrounds offering varying responses to issues such as race, class, gender, and ethnicity.

ENGL 135S (GH;GI) ALTERNATIVE VOICES IN AMERICAN LITERATURE (3) United States writers from diverse backgrounds offering varying responses to issues such as race, class, gender, and ethnicity.

ENGL 139 (GH;GI) BLACK AMERICAN LITERATURE (3) Fiction, poetry, and drama, including such writers as Baldwin, Douglass, Ellison, Morrison, and Wright.

ENGL 140 (GH) CONTEMPORARY LITERATURE (3) Writers such as Baldwin, Beckett, Bellow, Ellison, Gordimer, Lessing, Lowell, Mailer, Naipaul, Pinter, Plath, Pynchon, Rushdie, and Walker.

ENGL 145 IRISH RENAISSANCE (3) Literature of the Irish Renaissance through 1940; focus on the interplay of political, social, and cultural forces on literature.

ENGL 180 (GH) LITERATURE AND THE NATURAL WORLD (3) Literary representations of the natural world, focusing on English language traditions.

ENGL 182 (GH;GI) LITERATURE AND EMPIRE (3) Literature written in English from countries that were once part of European empires, e.g., India, Canada, South Africa, and others.
ENGL 182S (GH;GI) LITERATURE AND EMPIRE (3) Literature written in English from countries that were once part of European empires, e.g., India, Canada, South Africa, and others.
ENGL 184 (GH) (CMLIT) THE SHORT STORY (3) Lectures, discussion, readings in translation, with primary emphasis on major writers of the nineteenth and twentieth centuries.
ENGL 184S (GH) THE SHORT STORY (3) Lectures, discussion, readings in translation, with primary emphasis on major writers of the nineteenth and twentieth centuries.
ENGL 185 (GH) (CMLIT) THE MODERN NOVEL IN WORLD LITERATURE (3) Development of the modern novel in the last century (outside the British Isles and the United States); lectures, discussions, readings in translation.
ENGL 187 ENGLISH FRESHMAN SEMINAR (3) The meaning and advantages of a Liberal Arts education in context of a specific discipline.
ENGL 189 (GH) (CMLIT) THE FOUNDERS OF MODERN DRAMA (3) Playwrights who set the world's stage for twentieth-century drama; issues that continue to shape the contemporary theatrical world.
ENGL 191 (GH) SCIENCE FICTION (3) Science fiction as the literature of technological innovation and social change—its development, themes, and problems.
ENGL 192 THE LITERATURE OF FANTASY (3) Major realms of fantasy in English and American literature: daydream and nightmare, the pastoral, dystopia, utopia, apocalypse, and the heroic.
ENGL 193 (AM ST) AMERICAN FOLK SONG IN ENGLISH (3) British songs in America; native repertories, white and Negro; folk ballad; and musical development.
ENGL 194 (GH;GI) (WMNST) WOMEN WRITERS (3) Short stories, novels, poetry, drama, and essays by English, American, and other English-speaking women writers.
ENGL 194S (GH;GI) WOMEN WRITERS (3) Short stories, novels, poetry, drama, and essays by English, American, and other English-speaking women writers.
ENGL 196 (GH;GI) (AM ST;AMSTD) INTRODUCTION TO AMERICAN FOLKLORE (3) A basic introduction to verbal and nonverbal folklore stressing the basic procedures of collection, classification, and analysis.
ENGL 199 (GI) FOREIGN STUDY—ENGLISH (3–6) Studies in English language and/or literature.
ENGL 200 INTRODUCTION TO CRITICAL READING (3) Responses to a variety of literary texts written in English that evoke different approaches. Prerequisite: ENGL 015 or ENGL 030
ENGL 200W INTRODUCTION TO CRITICAL READING (3) Responses to a variety of literary texts written in English that evoke different approaches. Prerequisite: 6 credits of ENGL, ENLSH, or LIT
ENGL 202A (GWS) EFFECTIVE WRITING: WRITING IN THE SOCIAL SCIENCES (3) Instruction in writing persuasive arguments about significant issues in the social sciences. (A student may take only one course for credit from ENGL 202A, 202B, 202C, and 202D.) Prerequisite: ENGL 015 or ENGL 030 ; fourth-semester standing
ENGL 202B (GWS) EFFECTIVE WRITING: WRITING IN THE HUMANITIES (3) Instruction in writing persuasive arguments about significant issues in the humanities. (A student may take only one course for credit from ENGL 202A, 202B, 202C, and 202D.) Prerequisite: ENGL 015 or ENGL 030 ; fourth-semester standing
ENGL 202C (GWS) EFFECTIVE WRITING: TECHNICAL WRITING (3) Writing for students in scientific and technical disciplines. (A student may take only one course for credit from ENGL 202A, 202B, 202C, and 202D.) Prerequisite: ENGL 015 or ENGL 030 ; fourth-semester standing
ENGL 202D (GWS) EFFECTIVE WRITING: BUSINESS WRITING (3) Writing reports and other common forms of business communication. (A student may take only one course for credit from ENGL 202A, 202B, 202C, and 202D.) Prerequisite: ENGL 015 or ENGL 030 ; fourth-semester standing
ENGL 210 THE PROCESS OF WRITING (3) Examination of the relation between fiction and nonfiction; practice in principles common to all writing. Prerequisite: ENGL 015 or ENGL 030
ENGL 212 INTRODUCTION TO FICTION WRITING (3) Written exercises and short readings in the elements of fiction writing; the writing of at least one short story. Prerequisite: ENGL 015 or ENGL 030
ENGL 213 INTRODUCTION TO POETRY WRITING (3) Written exercises in the components and techniques of poetry writing in conjunction with selected readings. Prerequisite: ENGL 015 or ENGL 030
ENGL 215 INTRODUCTION TO ARTICLE WRITING (3) Written exercises in, and a study of, the principles of article writing; practice in the writing of specific articles. Prerequisite: ENGL 015 or ENGL 030
ENGL 221 BRITISH LITERATURE TO 1798 (3) Introduction to literary history and analysis; Beowulf and writers such as Chaucer, Shakespeare, Donne, Milton, Swift, Pope, and Fielding. Prerequisite: ENGL 015 OR ENGL 030
ENGL 221W BRITISH LITERATURE TO 1798 (3) Introduction to literary history and analysis. Beowulf and writers such as Chaucer, Shakespeare, Donne, Milton, Swift, Pope, and Fielding. Prerequisite: ENGL 015 or ENGL 030
ENGL 222 BRITISH LITERATURE FROM 1798 (3) Introduction to literary history and analysis; writers such as Austen, Wordsworth, Keats, Browning, Dickens, The Brontes, Yeats, Joyce, and Woolf. Prerequisite: ENGL 015 OR ENGL 030
ENGL 222W BRITISH LITERATURE FROM 1798 (3) Introduction to literary history and analysis. Writers such as Austen, Wordsworth, Keats, Browning, Dickens, the Brontes, Yeats, Joyce, and Woolf. Prerequisite: ENGL 015 or ENGL 030
ENGL 226 (GH;GI) LATINA AND LATINO BORDER THEORIES (3) English 226 will constitute a wide-ranging examination of contemporary texts (1960-present) central to the construction of contemporary Latino/a culture.

ENGL 231 AMERICAN LITERATURE TO 1865 (3) Introduction to literary history and analysis; writers such as Bradstreet, Franklin, Emerson, Hawthorne, Douglass, Thoreau, Fuller, Melville, Whitman, and Dickinson. Prerequisite: ENGL 015 OR ENGL 030

ENGL 231W AMERICAN LITERATURE TO 1865 (3) Introduction to literary history and analysis. Writers such as Bradstreet, Franklin, Emerson, Hawthorne, Douglass, Thoreau, Fuller, Melville, Whitman, and Dickinson. Prerequisite: ENGL 015 OR ENGL 030

ENGL 232 AMERICAN LITERATURE FROM 1865 (3) Introduction to literary history and analysis; writers such as Mark Twain, James, Cather, Frost, O'Neill, Faulkner, Hemingway, Hughes, and Morrison. Prerequisite: ENGL 015 OR ENGL 030

ENGL 232W AMERICAN LITERATURE FROM 1865 (3) Introduction to literary history and analysis. Writers such as Mark Twain, James, Cather, Frost, O'Neill, Faulkner, Hemingway, Hughes, and Morrison. Prerequisite: ENGL 015 or ENGL 030

ENGL 235 (GI) (AAA S) AFRICAN-AMERICAN ORAL FOLK TRADITION (3) The origins, forms, and function of the oral folk tradition of African Americans. Prerequisite: ENGL 015 OR ENGL 030

ENGL 240 EXPLORING LITERARY TRADITIONS (3 per semester, maximum of 6) The examination of specific literary traditions in English-language texts and an inquiry into the question of tradition itself. (Section subtitles may appear in the Schedule of Courses.) Prerequisite: ENGL 015 OR ENGL 030

ENGL 250 PEER TUTORING IN WRITING (3) Introduction to skills and attitudes required for successful peer tutoring in writing. Provides internship experience in a writing center. Prerequisite: ENGL 202A, ENGL 202B, ENGL 202C, or ENGL 202D ; approval of department

ENGL 261 EXPLORING LITERARY FORMS (3 per semester, maximum of 6) The examination of specific genres in English-language texts and an inquiry into the question of genre itself. (Section subtitles may appear in the Schedule of Courses.) Prerequisite: ENGL 015 OR ENGL 030

ENGL 262 (GH) READING FICTION (3) Elements of fiction including plot, character, viewpoint, and fictional genres in British, American, and other English-language traditions. Prerequisite: ENGL 015 or ENGL 030

ENGL 263 (GH) READING POETRY (3) Elements of poetry including meter, rhyme, image, diction, and poetic forms in British, American, and other English-language traditions. Prerequisite: ENGL 015 or ENGL 030

ENGL 265 (GH) READING NONFICTION (3) Forms of nonfictional prose such as autobiography, biography, essay, letter, memoir, oration, travelogue in British, American, and other English-language traditions. Prerequisite: ENGL 015 or ENGL 030

ENGL 268 (GH) READING DRAMA (3) Elements of drama including plot, character, dialogue, staging, and dramatic forms in British, American, and other English-language traditions. Prerequisite: ENGL 015 OR ENGL 030

ENGL 281 TELEVISION SCRIPT WRITING (3) An introduction to the writing of scripts for television production. Prerequisite: ENGL 015 or ENGL 030

ENGL 294 RESEARCH TOPICS (1–12) Individual or small group instruction.

ENGL 296 INDEPENDENT STUDIES (1–18)

ENGL 299 (GI) FOREIGN STUDIES (1–12)

ENGL 300M HONORS COURSE IN ENGLISH (3–12) Reading, group discussions, and oral and written reports on various specific authors and literary works. Prerequisite: ENGL 015 or ENGL 030 ; approval of the departmental Honors Committee

ENGL 310H HONORS THESIS IN ENGLISH (3) Research paper or creative project on a topic approved by the Departmental Honors Committee. Prerequisite: 9 credits of ENGL 300H

ENGL 395 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor

ENGL 399 (GI) FOREIGN STUDY—ENGLISH (3–6) Advanced studies in English language and/or literature.

ENGL 400 AUTHORS, TEXTS, CONTEXTS (3 per semester, maximum of 6) Styles, cultural milieus, critical perspectives toward particular English- language authors and/or movements they represent, and the idea of authorship. (Section subtitles may appear in the Schedule of Courses.) Prerequisite: ENGL 015 OR ENGL 030

ENGL 401 STUDIES IN GENRE (3 per semester, maximum of 6) English-language texts exemplifying particular genres, with attention to critical theories, historical development, rhetorical strategies, and social, cultural, and aesthetic values. (Section subtitles may appear in the Schedule of Courses.) Prerequisite: ENGL 015 OR ENGL 030

ENGL 402 LITERATURE AND SOCIETY (3 per semester, maximum of 6) Texts confronting social, political, technological, or other issues in the English-speaking world. (Section subtitles may appear in the Schedule of Courses.) Prerequisite: ENGL 015 OR ENGL 030

ENGL 403 LITERATURE AND CULTURE (3 per semester, maximum of 6) Historical, theoretical, and practical issues within cultural studies in relation to English-speaking texts. (Section subtitles may appear in the Schedule of Courses.) Prerequisite: ENGL 015 OR ENGL 030

ENGL 404 MAPPING IDENTITY, DIFFERENCE, AND PLACE (3 per semester, maximum of 6) Ethnicity, gender, class, race with reference to theoretical inquiry into identity, difference, and place in English-language literatures. (Section subtitles may appear in the Schedule of Courses.) Prerequisite: ENGL 015 OR ENGL 030

ENGL 405 TAKING SHAKESPEARE FROM PAGE TO STAGE (3) Students experience a Shakespeare play as a text to be explicated and as a script to be performed. Prerequisite: permission of program

ENGL 407 HISTORY OF THE ENGLISH LANGUAGE (3) Historical and structural study of developments in English sounds, forms, inflections, syntax, derivations, and meanings. Prerequisite: ENGL 100 ; ENGL 202A, ENGL 202B, ENGL 202C, or ENGL 202D

ENGL 409 COMPOSITION THEORY AND PRACTICE FOR TEACHERS (3) An overview of the theory and practice of writing for teachers, with emphasis on the writing process. Prerequisite: permission of the program Concurrent: EDUC 452

ENGL 411 PROBLEMS OF STYLE (3) Analysis and practice of English prose styles. Prerequisite: ENGL 202A, ENGL 202B, ENGL 202C, or ENGL 202D ; ENGL 212, ENGL 213, or ENGL 215

ENGL 412 ADVANCED FICTION WRITING (3 per semester, maximum of 6) Advanced study of the techniques of fiction writing; regular practice in writing the short story; group discussion of student work. Prerequisite: ENGL 212 and permission of the department

ENGL 413 ADVANCED POETRY WRITING (3 per semester, maximum of 6) Advanced study of the techniques of poetic composition; regular practice in writing poetry; group discussion of student work. Prerequisite: ENGL 213 and permission of the department

ENGL 414 BIOGRAPHICAL WRITING (3) Writing of biography and autobiography, character sketches, "profiles," and literary portraits; analysis and interpretations of source materials. Prerequisite: ENGL 200, ENGL 202B, ENGL 210, ENGL 212, or ENGL 215

ENGL 415 ADVANCED NONFICTION WRITING (3 per semester, maximum of 6) Advanced study of the principles of nonfiction; substantial practice in writing and submitting magazine articles for publication. Prerequisite: ENGL 215 and permission of the department

ENGL 416 SCIENCE WRITING (3 per semester, maximum of 6) Prepares scientists and writers to gather, interpret, and present scientific information to the layman with clarity and accuracy. Prerequisite: COMM 260W, ENGL 202C, ENGL 210, ENGL 215, or ENGL 421

ENGL 417 THE EDITORIAL PROCESS (3) The process of editing from typescript through final proof. Prerequisite: ENGL 202A, ENGL 202B, ENGL 202C, ENGL 202D, ENGL 210, ENGL 215, or ENGL 410

ENGL 418 ADVANCED TECHNICAL WRITING AND EDITING (3 per semester, maximum of 6) Preparing and editing professional papers for subject specialists and for others interested in careers as writers or editors. Prerequisite: ENGL 202A, ENGL 202B, ENGL 202C, ENGL 202D, or ENGL 215

ENGL 419 ADVANCED BUSINESS WRITING (3) Preparing and editing reports and presentations common to business, industry, and government. Prerequisite: ENGL 202A, ENGL 202B, ENGL 202C, or ENGL 202D

ENGL 420 WRITING FOR THE WEB (3) Analysis and composition of informative, persuasive, and "creative" Web texts, based on rhetorical principles; no prior Web writing experience required. Prerequisite: ENGL 015 or ENGL 030

ENGL 421 ADVANCED EXPOSITORY WRITING (3) Develops skill in writing expository essays, with particular attention to style. Intended for liberal arts majors. Prerequisite: ENGL 202A, ENGL 202B, ENGL 202C, or ENGL 202D

ENGL 422 FICTION WORKSHOP (3 per semester, maximum of 6) Practice and criticism in the composition of the short story and the novel. Prerequisite: ENGL 412

ENGL 423 POETRY WRITING WORKSHOP (3 per semester, maximum of 6) Extensive practice in writing poetry; consideration of contemporary poetic forms; selected readings. Prerequisite: ENGL 413

ENGL 425 NONFICTION WORKSHOP (3 per semester, maximum of 6) Extensive writing of nonfiction for publication; an introduction to the principles of writing the nonfiction book. Prerequisite: ENGL 415

ENGL 426 (GI) CHICANA AND CHICANO CULTURAL PRODUCTION: LITERATURE, FILM, MUSIC (3 credits per semester) An in-depth study of Chicana/Chicano literature, film, and music from the inception of the Chicano Movement (1965-1975) to the present. Prerequisite: 3 credits in English

ENGL 430 THE AMERICAN RENAISSANCE (3) Studies in the works and the interrelationships of writers such as Emerson, Hawthorne, Poe, Thoreau, Whitman, Melville, and Dickinson. Prerequisite: ENGL 015 or ENGL 030

ENGL 431 (GI) (AMSTD) BLACK AMERICAN WRITERS (3 per semester, maximum of 6) A particular genre or historical period in the development of Black American literature. Prerequisite: ENGL 015 OR ENGL 030

ENGL 432 THE AMERICAN NOVEL TO 1900 (3) Such writers as Hawthorne, Melville, Stowe, Mark Twain, James, Crane, Chopin, and others. Prerequisite: ENGL 015 or ENGL 030

ENGL 433 THE AMERICAN NOVEL: 1900-1945 (3) Such writers as Wharton, Dreiser, Cather, Fitzgerald, Faulkner, Hemingway, Hurston, Wright, and others. Prerequisite: ENGL 015 or ENGL 030

ENGL 434 (AMSTD) TOPICS IN AMERICAN LITERATURE (3 per semester) Focused study of a particular genre, theme, or problem in American literature. (May be repeated for credit.) Prerequisite: 6 credits of ENGL, ENLSH, or LIT

ENGL 435 THE AMERICAN SHORT STORY (3) Development of the short story as a recognized art form, with emphasis on major writers. Prerequisite: ENGL 015 or ENGL 030

ENGL 436 AMERICAN FICTION SINCE 1945 (3) Representative fiction by such writers as Barth, Bellow, Ellison, Heller, Mailer, Morrison, Nabokov, Oates, O'Connor, Pynchon, Updike, Walker. Prerequisite: ENGL 015 or ENGL 030

ENGL 437 THE POET IN AMERICA (3) American poets such as Bradstreet, Taylor, Poe, Emerson, Whitman, Dickinson, Frost, Eliot, Stevens, Hughes, Brooks, Moore, Williams, Plath, Rich, Lowell. Prerequisite: ENGL 015 or ENGL 030

ENGL 438 AMERICAN DRAMA (3) Development from the colonial period to playwrights such as O'Neill, Wilder, Hellman, Miller, Williams, Albee, Shepard, Norman, Wilson, and others. Prerequisite: ENGL 015 or ENGL 030

ENGL 439 AMERICAN NONFICTION PROSE (3) Major prose writers such as Franklin, Emerson, Thoreau,

Fuller, Henry Adams, Mailer, Baldwin, McCarthy, Dillard, Didion, Angelou, and others. Prerequisite: ENGL 015 or ENGL 030

ENGL 440 STUDIES IN SHAKESPEARE (3) Intensive study of a single genre, topic, or critical approach to selected plays. Prerequisite: ENGL 015 OR ENGL 030

ENGL 441 CHAUCER (3) The principal narrative poems and their background. Prerequisite: ENGL 015 or ENGL 030

ENGL 442 MEDIEVAL ENGLISH LITERATURE (3) Study of major works and genres of medieval English literature, exclusive of Chaucer. Prerequisite: ENGL 015 OR ENGL 030

ENGL 443 THE ENGLISH RENAISSANCE (3) Such writers as More, Sidney, Spenser, Shakespeare, Donne, Jonson, Bacon, and Marvell. Prerequisite: ENGL 015 or ENGL 030

ENGL 444 SHAKESPEARE (3) Selected tragedies, comedies, and histories. Prerequisite: ENGL 015 or ENGL 030

ENGL 445 SHAKESPEARE'S CONTEMPORARIES (3) Selected plays by Shakespeare's major predecessors and contemporaries: Kyd, Marlowe, Jonson, Webster, Marston, Middleton, and others. Prerequisite: ENGL 015 or ENGL 030

ENGL 446 MILTON (3) Analysis of principal poems and their background. Prerequisite: ENGL 015 or ENGL 030

ENGL 447 THE RESTORATION AND THE EIGHTEENTH CENTURY (3) The neoclassical age (1660-1776). Such writers as Dryden, Congreve, Swift, Pope, Fielding, Goldsmith, Sheridan, Boswell, Johnson. Prerequisite: ENGL 015 or ENGL 030

ENGL 448 THE ENGLISH NOVEL TO JANE AUSTEN (3) Novelists such as Defoe, Richardson, Fielding, Smollett, Sterne, and Austen. Prerequisite: ENGL 015 or ENGL 030

ENGL 450 THE ROMANTICS (3) Poets such as Blake, Wordsworth, Coleridge, Keats, Shelley, and Byron; also prose by writers such as Hazlitt, Lamb, and DeQuincey. Prerequisite: ENGL 015 or ENGL 030

ENGL 452 THE VICTORIANS (3) Poets such as Tennyson, Browning, Arnold, and Hopkins; also prose by writers such as Carlyle, Mill, Ruskin, and Arnold. Prerequisite: ENGL 015 or ENGL 030

ENGL 453 VICTORIAN NOVEL (3) Novelists such as the Brontes, Thackeray, Dickens, George Eliot, Meredith, and Hardy. Prerequisite: ENGL 015 or ENGL 030

ENGL 454 MODERN BRITISH AND IRISH DRAMA (3) From Wilde and Shaw to the present season. Prerequisite: ENGL 015 or ENGL 030

ENGL 455 TOPICS IN BRITISH LITERATURE (3 per semester) Focused study of a particular genre, theme, or problem in British literature. (May be repeated for credit.) Prerequisite: 6 credits of ENGL, ENLSH, or LIT

ENGL 456 BRITISH FICTION, 1900-1945 (3) Major writers such as Conrad, Lawrence, Mansfield, Forster, Joyce, Woolf, Waugh, Greene, Bowen, Beckett, and others. Prerequisite: ENGL 015 or ENGL 030

ENGL 457 BRITISH FICTION SINCE 1945 (3) Readings in British fiction since World War II. Prerequisite: ENGL 015 OR ENGL 030

ENGL 458 TWENTIETH-CENTURY POETRY (3) Poets writing in English such as Yeats, Pound, Eliot, Frost, Auden, Stevens, Plath, Bishop, Brooks, H.D., and others. Prerequisite: ENGL 015 or ENGL 030

ENGL 461 (GI) THE VERNACULAR ROOTS OF AFRICAN AMERICAN LITERATURE (3) The relationship between oral tradition and literary texts and the double consciousness of African American voice in "print." Prerequisite: ENGL 015 OR ENGL 030

ENGL 462 (GI) (WMNST) READING BLACK, READING FEMINIST (3) Female identity and its construction in textual representations of gender, class, color, and cultural difference in English-language literatures. Prerequisite: ENGL 015 OR ENGL 030

ENGL 463 (GI) AFRICAN AMERICAN AUTOBIOGRAPHY (3) The African American literary quest for identity and its adaptation to Euro-American culture and autobiographies. Prerequisite: ENGL 015 or ENGL 030

ENGL 466 (GI) AFRICAN AMERICAN NOVEL I (3) Thematic, structural, and stylistic characteristics of the African American novel from residually oral forms to satiric realism. Prerequisite: ENGL 015 or ENGL 030

ENGL 467 (GI) AFRICAN AMERICAN NOVEL II (3) Thematic, stylistic, and structural characteristics of the African American novel from naturalism to modernism and postmodernism. Prerequisite: ENGL 015 or ENGL 030

ENGL 468 (GI) AFRICAN AMERICAN POETRY (3) African American poetry within the contexts of the black oral tradition and transformed European literary tradition. Prerequisite: ENGL 015 or ENGL 030

ENGL 469 (GI) (AAA S) SLAVERY AND THE LITERARY IMAGINATION (3) The impact of slavery on the petitions, poetry, slave narratives, autobiographies, and novels of African Americans. Prerequisite: ENGL 015 or ENGL 030

ENGL 470 RHETORICAL THEORY AND PRACTICE (3) Application of certain rhetorical principles to problems in composition. Writing exercise. Designed as preparation for the teaching of composition. Prerequisite: ENGL 015 or ENGL 030

ENGL 471 RHETORICAL TRADITIONS (3 per semester, maximum of 6) Introduces major traditions of rhetorical inquiry and their relevance for English studies. (Section subtitles may appear in the Schedule of Courses.) Prerequisite: ENGL 015 OR ENGL 030

ENGL 472 CURRENT THEORIES OF WRITING AND READING (3 per semester, maximum of 6) Investigates models of textual production and reception current within English studies. (Section subtitles may appear in the Schedule of Courses.) Prerequisite: ENGL 015 OR ENGL 030

ENGL 473 RHETORICAL APPROACHES TO DISCOURSE (3 per semester, maximum of 6) Practices the criticism of written texts from selected rhetorical perspectives. (Section subtitles may appear in the Schedule of Courses.) Prerequisite: ENGL 015 OR ENGL 030
ENGL 474 ISSUES IN RHETORIC AND COMPOSITION (3 per semester, maximum of 6) Examines selected topics in the field of rhetoric and composition. (Section subtitles may appear in the Schedule of Courses.) Prerequisite: ENGL 015 OR ENGL 030
ENGL 481 LITERARY THEORY: HISTORICAL PERSPECTIVES (3) Selected topics in the history of literary criticism and theory within the English-language tradition. Prerequisite: ENGL 015 OR ENGL 030
ENGL 482 CONTEMPORARY LITERARY THEORY AND PRACTICE (3) Contemporary literary theories and their implication for critical practice as applied to British, American, and other English-language literary works. Prerequisite: ENGL 015 OR ENGL 030
ENGL 483 PROBLEMS IN CRITICAL THEORY AND PRACTICE (3) Intensive study of one or more recent theoretical approaches as applied to British, American, and other English-language literary works. Prerequisite: ENGL 015 OR ENGL 030
ENGL 485 AUSTRALIAN AND NEW ZEALAND LITERATURE AND CULTURE (3) Questions of nationality, identity, gender, race, class, colonialism, and postcolonialism in these literatures. Prerequisite: ENGL 015 OR ENGL 030
ENGL 487W SENIOR SEMINAR (3) Issues, themes, periods, critical theories, etc., that invite students to use prior English studies, limited to seniors majoring in English. Prerequisite: six credits of 400-level courses in English
ENGL 488 (CMLIT) MODERN CONTINENTAL DRAMA (3) From Ibsen to the drama of today: Strindberg, Chekhov, Hauptmann, Pirandello, Ionesco, Beckett, Genet, and others. Prerequisite: ENGL 015 or ENGL 030
ENGL 489 (WOMST) BRITISH WOMEN WRITERS (3) A study of selected British women writers. Prerequisite: 6 credits of ENGL, ENLSH, or LIT
ENGL 490 (GI) (WMNST) WOMEN WRITERS AND THEIR WORLDS (3) American and British literature written from the perspective of women. Prerequisite: ENGL 015 or ENGL 030
ENGL 491 THE CAPSTONE COURSE IN PROFESSIONAL WRITING (3) This culminating course for Professional Writing majors concentrates on reflective analyses, design, and presentation of documents in the development of professional portfolios. Prerequisite: ENGL 015 or ENGL 030 ; ENGL 202A, ENGL 202B, ENGL 202C, or ENGL 202D ;seventh-semester standing or higher; enrollment in Professional Writing major
ENGL 492 (AMSTD;WOMST) AMERICAN WOMEN WRITERS (3) A study of selected American women writers. Prerequisite: 6 credits of ENGL, ENLSH, or LIT
ENGL 493 (AM ST) THE FOLKTALE IN AMERICAN LITERATURE (3) A survey of the literary uses of the folktale and legendary materials, with particular concentration on the literature of America. Prerequisite: ENGL 015 or ENGL 030
ENGL 495 INTERNSHIP (3–12) Supervised practicum in fields appropriate to the English major.
ENGL 496 INDEPENDENT STUDIES (1–18)
ENGL 499 (GI) FOREIGN STUDY—ENGLISH (3–6) Studies abroad in English language and/or literature.

ENGLISH (ENLSH)

Capital College

ENLSH 310 INTRODUCTION TO LINGUISTICS (3) An in-depth survey of the English language, its history, dialects, and its various grammars: traditional, structural, transformational.
ENLSH 402 ENGLISH COMPOSITION: THEORY AND PRACTICE (1–3) An introduction to theories of writing and applications of those theories to college and secondary school writing. Prerequisite: completion of one semester as a student at Penn State Harrisburg
ENLSH 407 CREATIVE WRITING (3) A workshop in the practice of creative writing either fiction and/or poetry. Prerequisite: 6 CREDITS OF ENGLISH

ENGLISH AS A SECOND LANGUAGE (ESL)

College of the Liberal Arts

ESL 004 ESL/COMPOSITION FOR AMERICAN ACADEMIC COMMUNICATION I (3) For beginning-intermediate level non-native speakers of English to improve their overall composition skills in preparation for future American academic writing assignments. This course may not be used to satisfy the basic minimum requirements for graduation in any baccalaureate degree program.
ESL 015 (GWS) ESL/COMPOSITION FOR AMERICAN ACADEMIC COMMUNICATION II (3) For intermediate/advanced level non-native speakers of English to develop strategies for reading and writing American academic discourse. Prerequisite: a grade of C or higher required in SPCOM 004
ESL 114G AMERICAN ORAL ENGLISH FOR ACADEMIC PURPOSES (3) Instruction in ESL for international teaching assistants that focuses on the use of oral language skills in an academic setting.
ESL 115G AMERICAN ORAL ENGLISH FOR ITAS I (3–9) Initial course in American Oral English for preparation of international teaching assistants. Prerequisite: score below 200 on the American English Oral Communicative Proficiency Test (AEOCPT)
ESL 116G ESL/COMPOSITION FOR ACADEMIC DISCIPLINES (3) For high, intermediate, and advanced

international students at the graduate level to engage in research in their academic disciplines.
ESL 117G AMERICAN ORAL ENGLISH FOR ITAS II (3–9) Intermediate course in American Oral English for preparation of international teaching assistants. Prerequisite: score of 200-229 on the American English Oral Communicative Proficiency Test (AEOCPT) or a grade of A required in ESL 115G
ESL 118G AMERICAN ORAL ENGLISH FOR ITAS III (3) Advanced course in American Oral English for preparation of international teaching assistants. Prerequisite: score of 230-249 on the American English Oral Communicative Proficiency Test (AEOCPT) or a grade of A required in ESL 117G
ESL 297 SPECIAL TOPICS (1–9)
ESL 497 SPECIAL TOPICS (1–9)

ENTOMOLOGY (ENT)

Eberly College of Science
ENT 012 BIOLOGY AND MANAGEMENT OF PLANT PESTS (3) Basic and practical information on the identification, habits, and control of important insect pests of plants and plant products.
ENT 015 BEEKEEPING (3) Honeybee biology, social behavior, hive products, pollination, management techniques, and problems associated with beekeeping.
ENT 202 (GN) THE INSECT CONNECTION (3) An introduction to the diversity of insects and the ways in which they interact with humans and impact our world.
ENT 296, 496 INDEPENDENT STUDIES (1-18)
ENT 297, 397, 497 SPECIAL TOPICS (1-9)
ENT 300 BIOLOGY OF INSECTS (3) Insect growth, reproduction, and identification; how specialization enables them to interact with essential needs and their own kind. Prerequisite: BIOL 101, BIOL 102
ENT 301 INSECTS AND ENVIRONMENT (3) Beneficial and detrimental interactions among insects, plants, animals, and humans; population regulation of beneficial, pest, and innocuous species. Prerequisite: ENT 300
ENT 313 INTRODUCTION TO ENTOMOLOGY (2) Introduction to basic entomology, covering insect diversity, identification, structure and function, and principles of management. Prerequisite: 3 credits of natural science Concurrent: ENT 315
ENT 314 MANAGEMENT OF INSECT PESTS OF ORNAMENTALS (1) Diagnosis and management of insect pests on shrubs and trees in the landscape or production nursery. Prerequisite: ENT 313
ENT 315 TEACHING WITH INSECTS (1) An introduction to inquiry-based life science teaching using insects as model systems. Concurrent: ENT 313
ENT 316 FIELD CROPS ENTOMOLOGY (1) Laboratory-based approach to identification and management of insect pests of agronomic crops. Prerequisite: ENT 313
ENT 319 FOREST INSECT MANAGEMENT (1) Management of insects affecting development of productivity of the forest ecosystems. Prerequisite: ENT 313 Concurrent: FOR 204
ENT 395 INTERNSHIP (10-12) Supervised field experience and study related to the student's major professional interest. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by department; cumulative GPA of 2.00 or higher; 6 credits of entomology; at least fourth-semester standing
ENT 402 (V SC) BIOLOGY OF ANIMAL PARASITES (3) An introduction to animal parasitology. Emphasizes principles, economic importance, host/parasite interactions, epizootiology, zoonoses, control, and taxonomy. Prerequisite: BIOL 110
ENT 410 INSECT STRUCTURE AND FUNCTION (3) Integrated physiology and anatomy of insects; emphasis on unique adaptations, genetic regulation of development, insects as model systems, environmental physiology. Prerequisite: BIOL 110, BIOL 220W, BIOL 230W, BIOL 240W
ENT 411 LABORATORY INVESTIGATIONS INTO INSECT STRUCTURE AND FUNCTION (2) Laboratory investigations into integrated physiology and anatomy of insects; emphasis on mechanisms of regulation, diversity, and introduction to experimental techniques. Prerequisite: OR CONCURRENT: ENT 410
ENT 412 INSECT TAXONOMY (3) Identification and classification of insects to family level; introduction to insect phylogeny, life history, and evolution. Prerequisite: BIOL 110, BIOL 220W
ENT 420 INTRODUCTION TO POPULATION DYNAMICS (3) Principles of population regulation, demographic analysis, modeling of dynamic processes are discussed; laboratories involve the exploration of population growth models. Prerequisite: BIOL 110, BIOL 220W
ENT 425 FRESHWATER ENTOMOLOGY (3) Collection and identification of insects and other arthropods in freshwater ecosystems; field study of habitats.
ENT 430 (B M B;BIOL) DEVELOPMENTAL BIOLOGY (3) Molecular and genetic analyses of mechanisms involved in differentiation and determination in biological systems. Prerequisite: BIOL 222; B M B 252 or BIOL 230W
ENT 455 ECONOMIC ENTOMOLOGY (3) Life histories and damage characteristics of major economic pests; pest survey and monitoring management techniques; formulation and application of pesticides. Prerequisite: ENT 300, ENT 301
ENT 457 INTRODUCTION TO INTEGRATED PEST MANAEMENT (3) Ecological basis for pest management; principles underlying selected management tactics including application and efficacy; development of pest management systems. Prerequisite: 6 credits of life sciences

ENTREPRENEURSHIP (ENTR)

Altoona College

ENTR 300 PRINCIPLES OF ENTREPRENEURSHIP (3) Overview of the fundamental principles and processes of entrepreneurship including idea generation and opportunity analysis. Prerequisite: ACCTG 211, ECON 002

ENTR 320 ENTREPRENEURSHIP AND NEW VENTURE CREATION (3) Explores the process for starting and growing a new venture including the development of a business plan. Prerequisite: ENTR 300

ENTR 400 FINANCING ENTREPRENEURIAL VENTURES (3) Overview of alternative forms of financing including seed capital, valuing a company, going public, partnerships, and acquisitions. Prerequisite: B A 243 or B LAW 243; ENTR 320; FIN 100 or FIN 301

ENTR 410 ENTREPRENEURIAL MARKETING (3) Principles of Internet marketing and strategies for marketing new ventures on the Web. Prerequisite: ENTR 320, M I S 204; MKTG 221 or MKTG 301

ENTR 420 LEADERSHIP AND GROWTH OF NEW VENTURES (3) Leadership of an entrepreneurial organization, including organizational effectiveness, stages of entrepreneurial growth, strategies for the future, and developing people. Prerequisite: ENTR 320; MGMT 100 or MGMT 301

ENTR 430 ENTREPRENEURSHIP AND NEW PRODUCT DEVELOPMENT (3) Examines the process of designing, testing and launching new products, and developing a strategy for commercialization of the technology. Prerequisite: ENTR 300

ENTR 440 ENTREPRENEURSHIP AND FRANCHISING (3) Overview of the entire franchising process with a focus on licensing and distributorship, trade marks, strategy, and growing the enterprise. Prerequisite: ENTR 300

ENTR 496 INDEPENDENT STUDIES (1–18)

ENTR 497 SPECIAL TOPICS (1–9)

ENVIRONMENTAL ENGINEERING (ENVE)

Capital College

ENVE 301W ENVIRONMENTAL MICROBIOLOGY (3) Fundamentals of microbial ecology and environmental microbiology with an emphasis on aspects of these fields important to environmental engineers. Prerequisite: introductory chemistry, high school biology

ENVE 397 SPECIAL TOPICS (1–9)

ENVE 401 OCCUPATIONAL SAFETY AND ENVIRONMENTAL HEALTH (1) Regulations, management practices, hazard identification, exposure assessment, monitoring, employee protection, and program management for occupational safety and health. Prerequisite: CHEM 012

ENVE 411 WATER SUPPLY AND POLLUTION CONTROL (3) Water supply, wastewater characteristics, design of unit processes for water and wastewater treatment, sludge processing, and related new technologies. Prerequisite: CHM 301, ENVE 301W

ENVE 413W OPERATION AND CONTROL OF TREATMENT SYSTEMS (3) Wastewater treatment, water treatment, solids handling, hazardous waste site control and operations, operator certification, report writing. Prerequisite: ENVE 411, ENVE 424 Concurrent: ENVE 416

ENVE 415 HYDROLOGY (3) Watershed response to rainfall events; hydrologic systems, ground water flow. Prerequisite: ENVE 361, MA SC 422

ENVE 416 TREATMENT PLANT DESIGN (3) Design of treatment facilities for water and waste water based on regulatory requirements and standards. Prerequisite: ENVE 411

ENVE 417 HYDRAULIC DESIGN (3) Design of water and waste water conveyance systems and storage facilities. Prerequisite: ENVE 415

ENVE 424 SOLID WASTE MANAGEMENT (3) Solid waste collection and disposal techniques; recycling and design optimization; including content analysis, legislation, and planning. Prerequisite: seventh-semester standing

ENVE 425 HAZARDOUS WASTE MANAGEMENT (3) Overview of regulations, risk assessment, waste minimization and pollution prevention, treatment of hazardous waste, and remediation of contaminated sites. Prerequisite: C E T 301, C E T 411, C E T 424, CHM 301

ENVE 430 SUSTAINABLE ENGINEERING (3) A course on engineering which uses ecological principles to minimize waste and maximally use input materials. Prerequisite: Permission of program

ENVE 441 WATER TREATMENT PLANT DESIGN AND OPERATION (4) This course covers water supply, design, and operation of unit operations for water treatment, and related new technologies. Prerequisite: CHM 301

ENVE 442 WASTEWATER TREATMENT PLANT DESIGN AND OPERATION (4) Covers wastewater generation, design and operation of unit operations for wastewater treatment, sludge handling and disposal options, related new technologies. Prerequisite: CHM 301, ENVE 301W

ENVE 451 ENVIRONMENTAL SANITATION (3) Epidemiology, toxicology, radiation health and safety, vector control, food protection, air, water, and solid waste control, environmental interrelationships. Prerequisite: fifth-semester standing

ENVE 460 ENVIRONMENTAL LAW (3) This course provides a survey of Federal and State environmental laws, including statutory, common and administrative law. May not be taken for graduate credit by Dickinson School of Law students in the concurrent J.D./EPC programs. Prerequisite: senior standing, graduate standing or permission of program.

ENVE 470 AIR QUALITY (3) Overview of air quality issues with regard to the sources, measurements, effects, transport and control of potential air contaminants. Prerequisite: CHM 201, CHM 202, CHM 301, E T 451
ENVE 497 SPECIAL TOPICS (1–9)

ENVIRONMENTAL AND RENEWABLE RESOURCE ECONOMICS (E RRE)

College of Agricultural Sciences

E RRE 201 (AG EC) INTRODUCTORY ENVIRONMENTAL AND RESOURCE ECONOMICS (3) Apply principles of economics to analyze environmental protection policies and natural resource use decision. Examine contemporary policy issues. Prerequisite: AG BM 101 or ECON 002
E RRE 404 (AG EC) METHODS IN NATURAL RESOURCE AND ENVIRONMENTAL ECONOMICS (3) Students will learn empirical research methodology in the areas of environ- mental and natural resource economics. Prerequisite: AG EC 201 or ECON 302, ECON 428
E RRE 429 (AG EC) NATURAL RESOURCE ECONOMICS (3) Optimal management of resources; roles of markets and other institutions; resources and economic development; public policy. Prerequisite: ECON 302
E RRE 431W (AG EC) ECONOMIC ANALYSIS OF ENVIRONMENTAL AND RESOURCE POLICIES (3) Economic analysis of environmental and natural resource policies, benefit-cost analysis, non-market valuation techniques; resource damage assessment. Prerequisite: ECON 302

ENVIRONMENTAL RESOURCE MANAGEMENT (E R M)

College of Agricultural Sciences

E R M 151 CAREERS AND ISSUES IN ENVIRONMENTAL RESOURCE MANAGEMENT (1) Career opportunities and topical issues in the environmental sciences.
E R M 210 (GN) ENVIRONMENTAL FACTORS AND THEIR EFFECT ON YOUR FOOD SUPPLY (3) An exploration of how urban environmental problems influence our ability to obtain food and natural resources.
E R M 296 INDEPENDENT STUDIES (1–18)
E R M 297 SPECIAL TOPICS (1–9)
E R M 300 BASIC PRINCIPLES AND CALCULATIONS IN ENVIRONMENTAL ANALYSIS (3) This course will teach basic problem solving skills while using examples taken from environmental media—air, water, and soil. Prerequisite: BIOL 220W; CHEM 013, CHEM 014, CHEM 034; E R M 151, MATH 111 or MATH 141; STAT 240
E R M 411 LEGAL ASPECTS OF RESOURCE MANAGEMENT (3) Legal systems and lawmaking processes; property rights in land, water, and wildlife resources; jurisdictional problems in planning resource use. Prerequisite: E R M 151
E R M 412 RESOURCE SYSTEMS ANALYSIS (3) The concept of systems; techniques of analysis, including input/output, mathematical programming, and simulation; application to resource systems. Prerequisite: BIOL 220W, E R M 151, E R M 300, and STAT 240; MATH 111 or MATH 141
E R M 413W CASE STUDIES IN ECOSYSTEM MANAGEMENT (3) Application of biological, physical, and social science principles to ecosystem management problems; introduction to environmental impact analysis and review. Prerequisite: AG EC 201, BIOL 220W, SOILS 101 . Prerequisite or concurrent: E R M 412
E R M 422 POLLUTANT IMPACTS ON ANIMALS (1) Response of animals to pollutants, dose-response relationships, general and organ pathology. Prerequisite: BIOL 220W, BIOL 240W, CHEM 034
E R M 424 POLLUTANT IMPACTS ON AQUATIC SYSTEMS (1) Sources, types, impact of aquatic pollutants; processes regulating pollutant toxicity and fate; major issues in water pollution and its control. Prerequisite: BIOL 220W, CHEM 034, E R M 151
E R M 430 AIR POLLUTION IMPACTS TO TERRESTRIAL ECOSYSTEMS (3) Overview of the direct and indirect effects of air pollutants on terrestrial plants and ecosystems. Prerequisite: BIOL 220W or FOR 308
E R M 431 ENVIRONMENTAL TOXICOLOGY (3) Effects of pollutants on animal health at the chemical, physical, and cellular level. Prerequisite: BIOL 110, CHEM 012, CHEM 013
E R M 432 POLLUTION IN AQUATIC SYSTEMS (3) Sources, types, impacts of aquatic pollutants; processes regulating pollutant toxicity and fate; major issues in water pollution and its control. Prerequisite: E R M 300
E R M 433 TRANSFORMATION OF POLLUTANTS IN SOILS (3) Processes regulating fate and transport of metals, organics, nutrients, salts, pathogens, and radionuclides in soil systems. Prerequisite: CHEM 013, CHEM 014, SOILS 101
E R M 450 (W F S) WETLAND CONSERVATION (3) Wetland types, classification, functions and values; hydrology, soils, and plants; introduction to wetland identification and delineation; wetland regulations. Prerequisite: E R M 300 or W F S 209
E R M 495 INTERNSHIP (1–12) A supervised practicum to be offered in the environmental field. To be offered only for SA/UN grading. Prerequisite: prior approval of assignment by instructor
E R M 496 INDEPENDENT STUDIES (1–18)
E R M 497 SPECIAL TOPICS (1–9)
E R M 499 (GI) FOREIGN STUDIES (1–12)

ENVIRONMENTAL STUDIES (ENVST)

Altoona College

ENVST 100 (GS) VISIONS OF NATURE (3) An interdisciplinary introduction to environmental studies, including perspectives from ethics, economics, public policy, art, literature, history, geology, biology, and ecology.

ENVST 200 RESEARCH METHODS IN ENVIRONMENTAL STUDIES (3) Focus on interdisciplinary research methodologies from biology, social sciences, and humanities for the study of environmental issues and problems. Prerequisite: BIOL 110, ENGL 015, ENVST 100

ENVST 296, 496 INDEPENDENT STUDIES (1–18)

ENVST 297 SPECIAL TOPICS (1–9)

ENVST 395 INTERNSHIP (1–18)

ENVST 400W SENIOR SEMINAR IN ENVIRONMENTAL STUDIES (3) Writing-intensive study of a specified topic in environmental studies integrating approaches and research from a variety of disciplines. Prerequisite: ENVST 200

EXERCISE AND SPORT ACTIVITIES (ESACT)

College of Health and Human Development

SEE THE ONLINE BULLETIN FOR COURSE DESCRIPTIONS: **www.psu.edu/bulletins/bluebook** University Course Descriptions button, ESACT link.

BASIC INSTRUCTION COURSE—ESACT courses: Full- or partial-semester courses to develop physical and recreational skills and gain knowledge about them.

NOTE: ALL ESACT courses listed in the online bulletin satisfy the Health Sciences and Physical Education (GPE) component of the General Education program.

FINANCE (FIN)

Smeal College of Business

FIN 100 INTRODUCTION TO FINANCE (3) The nature, scope, and interdependence of the institutional and individual participants in the financial system. May not be used to satisfy Smeal College baccalaureate degree requirements. A student may not receive credit toward graduation for both FIN 100 and 301, or both FIN 100 and B A 301. Prerequisite: third-semester standing

FIN 108 PERSONAL FINANCE (3) Personal management of budgets, bank accounts, loans, credit buying, insurance, real estate and security buying. May not be used to satisfy Smeal College baccalaureate degree requirements. Prerequisite: third-semester standing

FIN 204 SECURITY MARKETS (3) Analysis of the organization and operation of stock and bond markets; security speculation, brokerage houses; exchange relations with other institutions; security price behavior; exchange regulation. Prerequisite: FIFTH-SEMESTER STANDING

FIN 296 INDEPENDENT STUDIES (1–18)

FIN 297 SPECIAL TOPICS (1–9)

FIN 301 CORPORATION FINANCE (3) The acquisition and management of corporate capital; analysis of operations, forecasting capital requirements, raising capital, and planning profits. May not be used to satisfy Smeal College baccalaureate degree requirements. A student may not receive credit toward graduation for both FIN 100 and 301, or for both B A 301 and FIN 301. Prerequisite: ACCTG 211; ECON 004, MGMT 301; MS&IS 200 or STAT 200; CMPSC 203 or M I S 103

FIN 305 FINANCIAL MANAGEMENT OF THE BUSINESS ENTERPRISE (3) Development of advanced practices of financial management and their application to decision making in business firm. Prerequisite: B A 301

FIN 305W FINANCIAL MANAGEMENT OF THE BUSINESS ENTERPRISE (3) Development of advanced practices of financial management and their application to decision making in a business firm. Prerequisite: B A 301

FIN 306W INVESTMENT VALUATION (3) Approaches to investment strategy, investment decisions; valuation of corporate securities, including the impact of dividend policy and capital structure. Prerequisite: FIN 301

FIN 307 APPLICATIONS OF FINANCIAL MANAGEMENT (3) Applications of decision-making procedures to realistic problems in financial management, emphasizing case analysis. Prerequisite: FIN 301, FIN 305W

FIN 397 SPECIAL TOPICS (1–9)

FIN 398 SPECIAL TOPICS (1–9)

FIN 405 ADVANCED FINANCIAL MANAGEMENT (3) An examination of the development and application of decision rules for major long-term financial and investment problems of the firm. Prerequisite: FIN 305W

FIN 406 SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT (3) Advanced valuation theory; fundamentals of security analysis; portfolio construction and management. Prerequisite: FIN 305W

FIN 407 (I B) MULTINATIONAL FINANCIAL MANAGEMENT (3) Analysis of the international aspects of managerial finance; emphasis on the impact of the international financial environment on firm operations. Prerequisite: FIN 305W

FIN 408 FINANCIAL MARKETS AND INSTITUTIONS (3) Functional analysis of major credit institutions; sources and uses of funds; impact of government regulation. Prerequisite: B A 301

FIN 409 (R EST) REAL ESTATE FINANCE AND INVESTMENT (3) The sources and uses of credit; instruments and methods of financing; the theory and practice or real estate investment analysis. Prerequisite: B A 301
FIN 410 SPECULATIVE MARKETS (3) Functions, techniques, and impact of speculation conducted through forward markets; the nature of speculative transactions, pricing, and methods of trading. Prerequisite: FIN 406
FIN 412 COMMERCIAL BANK MANAGEMENT (3) Fundamental principles underlying management of a commercial bank; capital funds; asset and liability management; value maximization; legal and operational constraints. Prerequisite: FIN 305W, FIN 408
FIN 494 RESEARCH PROJECTS (1–12) Supervised student activities on research projects identified on an individual or small-group basis.
FIN 496 INDEPENDENT STUDIES (1–18)
FIN 497 SPECIAL TOPICS (1–9)
FIN 498 SPECIAL TOPICS (1–9)

FINANCE (FNC)

Penn State Erie, The Behrend College
FNC 300 CORPORATION FINANCE (3) Valuation; risk and return concepts; capital budgeting, capital structure and working capital decisions. Prerequisite: ACCTG 211, ECON 002, ECON 004; MS&IS 200 or STAT 200; fifth-semester standing
FNC 330 PERSONAL FINANCIAL PLANNING (3) Developing financial plans including cash budgets, credit purchases, investments, and insurance. Prerequisite: fifth-semester standing or permission of instructor
FNC 340 INSURANCE PLANNING (3) Introduction to personal insurance including homeowner's, auto, life, disability, health, and Social Security.
FNC 397 SPECIAL TOPICS (1–9)
FNC 400 PROBLEMS IN FINANCIAL MANAGEMENT (3) Case studies are used to develop skills in solving a variety of financial management problems. Prerequisite: FNC 300
FNC 410 INTRODUCTION TO INVESTMENTS (3) Global markets and instruments, portfolio management and asset allocation, asset pricing models, case studies. Prerequisite: FNC 300
FNC 430 ESTATE PLANNING (3) Liquidity planning, titling and transfer of property, trusts, federal unified tax system, gifting, incapacity planning, legal documents. Prerequisite: ACNTG 320, FNC 330, FNC 340, FNC 410
FNC 450 RETIREMENT AND ADVANCED FINANCIAL PLANNING (3) Retirement planning: plan types, characteristics, applications, regulations, and asset management; financial planning: comprehensive capstone case studies. Prerequisite: FNC 430
FNC 460 INVESTMENT ANALYSIS (3) Analysis and valuation of equity, debt, and alternative investments. Prerequisite: FNC 410
FNC 470 INTERNATIONAL FINANCIAL MANAGEMENT (3) Financial decision making in an international environment; emphasis on topics relevant to small businesses and entrepreneurs. Prerequisite: FNC 300
FNC 480 ADVANCED FINANCIAL ANALYSIS (3) Capstone course integrating financial analysis coursework; advanced financial analysis topics: international investments, derivative securities, hedging, and financial engineering. Prerequisite: ACNTG 426, FNC 460
FNC 494 RESEARCH PROJECT (1–12)
FNC 495 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
FNC 496 INDEPENDENT STUDIES (1–18)
FNC 497 SPECIAL TOPICS (1–9)

FINANCIAL ANALYSIS (FINAN)

Capital College
FINAN 320 FINANCIAL MANAGEMENT (3) Nature of finance function; working capital and fixed-asset management; capital budgeting; sources of funds; dividend policies; mergers; securities markets. Prerequisite: ACCTG 211, ECON 002; MATH 110 or MATH 140; MS&IS 200 or STAT 200
FINAN 397 SPECIAL TOPICS (1–9)
FINAN 410 INVESTMENT AND PORTFOLIO ANALYSIS (3) Investment and risk, types of security investments, sources of investment information, the broker, the stock market, portfolio management. Prerequisite: FINAN 320
FINAN 421 PROBLEMS IN FINANCE (3) Case studies are used to develop professional skills in statistical and qualitative analysis of a wide variety of financial problems. Prerequisite: ECNMS 313, FINAN 320
FINAN 422 PORTFOLIO ANALYSIS AND MANAGEMENT (3) Provides the necessary tools to perform the optimal portfolio selection for the individual investor. Prerequisite: FINAN 410
FINAN 424 FINANCIAL INSTITUTIONS (3) The operations of financial institutions and the relationship with economic activity. Prerequisite: ECNMS 313, FINAN 320
FINAN 426 INTERNATIONAL BUSINESS FINANCE (3) Designed to develop the tools necessary to analyze the multinational business finance problem. Prerequisite: FINAN 320

FINAN 427 DERIVATIVE SECURITIES (3) Introduction to futures contracts and options, leading to a working understanding of their importance in financial management applications. Prerequisite: FINAN 410 or approval of program
FINAN 428 REAL ESTATE FINANCE (3) Real estate institutions and markets, real estate mathematics, mortgage instruments, investments, underwriting, and valuation. Prerequisite: FINAN 320
FINAN 430 COMPUTER APPLICATIONS AND FINANCIAL MODELING (3) Computer based financial modeling and applications in finance and financial analysis. Prerequisite: FINAN 320 or permission of program head
FINAN 456 INTERNATIONAL CAPITAL MARKETS (3) This course develops understanding of international capital markets by striking a balance between institutional details, theoretical foundation and practical application. Prerequisite: FINAN 320
FINAN 494 RESEARCH PROJECT (1–12)
FINAN 495 INTERNSHIP (1–18)
FINAN 496 INDEPENDENT STUDIES (1–18)
FINAN 497 SPECIAL TOPICS (1–9)

FINANCIAL SERVICES (FINSV)

Abington College
FINSV 400 INVESTMENT VALUATION FOR THE FINANCIAL SERVICES PROFESSIONAL (3) Approaches to investment strategies, investment decisions, and the valuation of corporate securities. Prerequisite: FIN 301
FINSV 411 FEDERAL INCOME TAXATION FOR THE FINANCIAL SERVICES PROFESSIONAL (3) Tax regulations, tax policy, tax determination, and tax planning applicable for personal/business decision making; emphasis on taxation of individuals. Prerequisite: ACCTG 211
FINSV 420 ESTATE PLANNING FOR THE FINANCIAL SERVICES PROFESSIONAL (3) Studies the processes relating to the use, conservation, and transfer of an individual's wealth; emphasizing investments, insurance and taxation. Prerequisite: FINSV 400, FINSV 411, INS 301

FIRST-YEAR SEMINAR (CAP)

Capital College
CAP 100S ORIENTATION TO THE UNDERGRADUATE EXPERIENCE (1) To facilitate transition of new students through active engagement and introduction to university and campus resources.
CAP 110S FIRST-YEAR SEMINAR FOR CAPITAL COLLEGE, THE SCHOOL OF BEHAVIORAL SCIENCES AND EDUCATION (1) Introduction to the discipline including: ethics, research methods, communications, career opportunities/issues and applied technology. Prerequisite: or concurrent: CAP 100S
CAP 120S FIRST-YEAR SEMINAR FOR BUSINESS (1) Introduction to the discipline including: ethics, research methods, communications, career opportunities/issues and applied technology. Prerequisite: or concurrent: CAP 100S
CAP 140S FIRST-YEAR SEMINAR FOR HUMANITIES (1) Introduction to the discipline including: ethics, research methods, communications, career opportunities/issues and applied technology. Prerequisite: or concurrent: CAP 100S
CAP 150S FIRST-YEAR SEMINAR FOR CAPITAL COLLEGE, THE SCHOOL OF PUBLIC AFFAIRS (1) Introduction to the discipline including: ethics, research methods, communications, career opportunities/issues and applied technology. Prerequisite: or concurrent: CAP 100S
CAP 160S FIRST-YEAR SEMINAR FOR CAPITAL COLLEGE, THE SCHOOL OF SCIENCE, ENGINEERING AND TECHNOLOGY (1) Introduction to the discipline including: ethics, research methods, communications, career opportunities/issues and applied technology. Prerequisite: or concurrent: CAP 100S

FOOD SCIENCE (FD SC)

College of Agricultural Sciences
FD SC 105 (GHS) (S T S) FOOD FACTS AND FADS (3) Impact on society and the individual of modern food technology, food laws, additives, etc.; historical, current, and futuristic aspects.
FD SC 197 SPECIAL TOPICS (1–9)
FD SC 200 INTRODUCTORY FOOD SCIENCE (3) General overview and principles; food constituents and properties; quality and safety; preservation methods; processing animal and plant products. Prerequisite: CHEM 012
FD SC 201 INTRODUCTORY FOOD SCIENCE PRACTICUM (1) Demonstration to illustrate actual chemical reactions in food systems and visits to campus and area food processing operations. Prerequisite: or concurrent: FD SC 200
FD SC 205 FOOD PLANT SANITATION (3) Organization and administration of food plant sanitation with emphasis on the production and maintenance of safe, wholesome food products. Prerequisite: FD SC 200
FD SC 206 IMPROVING FOOD QUALITY (3) Modern philosophies coupled with practical information on improving product quality, including topics on HACCP, SPC, recall procedures and customer relations. Prerequisite: FD SC 200
FD SC 207 (AN SC) ANIMAL PRODUCTS TECHNOLOGY (2) Composition, safety, palatability, preserva-

tion, and processing of foods from animals, impact of animal production and handling practices on product properties.
FD SC 208 (AN SC) ANIMAL PRODUCTS TECHNOLOGY LABORATORY (1) Harvesting and processing of foods from animals; hands-on and demonstration exercises; industry procedures for processing meat, milk, and egg products. Prerequisite: or concurrent: AN SC 207
FD SC 297 SPECIAL TOPICS (1–9)
FD SC 311 FUNDAMENTALS AND PROCESSING OF DAIRY PRODUCTS (4) Composition, properties, and physiochemical aspects of milk and milk products; unit operations in processing dairy products.
FD SC 313 PROCESSING OF PLANT PRODUCTS FOR FOOD USE (3) Handling, processing, and preserving plant products; includes edible fats and oils, cereals, fermented products, sugars, starches, proteins, fruits, and vegetables.
FD SC 320 POULTRY, MEAT, AND FISH TECHNOLOGY (3) Application of food science technology to the principles involved in processing, storage, and handling of poultry, meat, and fish products.
FD SC 397 SPECIAL TOPICS (1–9)
FD SC 400 FOOD CHEMISTRY (3) Chemical properties of food constituents as influenced by processing and storage. Prerequisite: CHEM 034. Prerequisite or concurrent: B M B 211
FD SC 402 FOOD CHEMISTRY LABORATORY (1) Selected experiments and demonstrations to illustrate chemical reactions of importance in foods. Prerequisite: or concurrent: B M B 211, B M B 212, FD SC 400
FD SC 404 SENSORY EVALUATION OF FOODS (3) Sensory evaluation of food, methods of test analyses, panel selection and training, taste sensation theory, consumer testing methods. Prerequisite: STAT 250, Junior standing
FD SC 406 PHYSIOLOGY OF NUTRITION (3) Physiological mechanisms involved in thirst and appetite, digestion, absorption, utilization of nutrients, respiration, and body temperature regulation. Prerequisite: BIOCH 211
FD SC 407 FOOD TOXINS (2) Microbiological and chemical aspects of food poisoning; toxicological principles; case histories and prevention of problems. Prerequisite: senior standing in food science or related majors
FD SC 408 APPLIED FOOD MICROBIOLOGY (2) Significance of microorganisms in food commodities, microbial spoilage, food- borne infections, and intoxication; methods of preservation, processing, and control. Prerequisite: MICRB 201, MICRB 202
FD SC 409W LABORATORY IN APPLIED FOOD MICROBIOLOGY (3) Methods of isolation, detection of spoilage, pathogenic microorganisms in foods; effects of processing and preservation on survival of food microorganisms. Prerequisite: MICRB 202. Prerequisite or concurrent: FD SC 408
FD SC 410 CHEMICAL METHODS OF FOOD ANALYSIS (3) Qualitative and quantitative determinations of food constituents. Prerequisite: BIOCH 212, FD SC 400
FD SC 411 MANAGING FOOD QUALITY (2) Principles and applications of Hazard Analysis Critical Control Points. Statistical tools for the control and improvement of food quality. Prerequisite: FD SC 408, STAT 250
FD SC 413 SCIENCE AND TECHNOLOGY OF PLANT FOODS (3) Physical and chemical behavior of plant-based raw materials and ingredients, with emphasis on parameters influencing finished product quality. Prerequisite: A S M 425, FD SC 400, FD SC 402, FD SC 408, FD SC 410
FD SC 414 SCIENCE AND TECHNOLOGY OF DAIRY FOODS (4) Physical and chemical behavior of dairy-based raw materials and ingredients, with emphasis on parameters influencing finished product specifications. Prerequisite: A S M 425, FD SC 400, FD SC 408, FD SC 410
FD SC 415 SCIENCE AND TECHNOLOGY OF MUSCLE FOODS (3) Physical and chemical properties of muscle food commodities, with emphasis on muscle-based ingredients in formulated foods. Prerequisite: A S M 425, FD SC 400, FD SC 402, FD SC 408, FD SC 410
FD SC 417 FOOD LAWS AND REGULATIONS (2) Historic and current aspects of government control of doing business with food (emphasis on the Food, Drug, and Cosmetic Act). Prerequisite: FD SC 200
FD SC 423 POLLUTANT IMPACTS ON FOODS (1) Fate and flow of pollutants; case studies of human exposure to specific pollutants. Prerequisite: 6 credits in biology or chemistry
FD SC 430 UNIT OPERATIONS IN FOOD PROCESSING (3) Thermal processing, refrigeration, freezing, dehydration, and concentration in the food industry, including effects on food quality; food packaging; waste management. Prerequisite: A S M 425, FD SC 400, FD SC 408
FD SC 490 UNDERGRADUATE SEMINAR (1) Seminars on topics of current general interest in food science and of importance to professional development. Intended primarily for undergraduate students in food science. Prerequisite: Senior standing in Food Science
FD SC 495 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of acitvity required. Prerequisite: PRIOR APPROVAL OF PROPOSED ASSIGNMENT BY INSTRUCTOR
FD SC 496 INDEPENDENT STUDIES (1–18)
FD SC 497 SPECIAL TOPICS (1–9)

FOREST TECHNOLOGY (FORT)

College of Agricultural Sciences

FORT 100 INTRODUCTION TO FORESTRY (1) A general introduction to forest ecology, history, management, and practices.
FORT 105 FOREST MENSURATION (3) Measurement of forests and forest products.

FORT 110 FOREST INVENTORIES (3) Application of forest mensuration, mapping, GIS, sampling, and statistical analysis to the inventory of forest resources. Prerequisite: FORT 105
FORT 120 FORESTRY COMPUTER APPLICATIONS (2) Computer hardware and software applications specific to forestry. Prerequisite: three credits of mathematics
FORT 130 FOREST MAPPING SYSTEMS (2) Mapping forest properties, using traditional mechanical drawing techniques, geographical positioning systems, geographic information systems, and spatial analysis of resources.
FORT 140 FOREST SURVEYING (3) Plane surveying including hand compass and survey equipment, map reading, deed and title research, land descriptions and property line location. Prerequisite: or concurrent: FORT 130, MATH 081
FORT 150 DENDROLOGY (3) Taxonomy, identification, ranges, and uses of important U.S. timber species and lesser vegetation of a regional nature.
FORT 160 SILVICULTURAL PRACTICES (3) Principles and techniques of forest establishment, culture, and regeneration systems. Prerequisite: FORT 150
FORT 170 FOREST HARVESTING AND OPERATIONS (3) Forest harvesting and intermediate operations: forest worker safety, hand and power tools, harvest planning, and best management practices. Prerequisite: FORT 110, FORT 160, American Red Cross Standard First Aid and CPR
FORT 175 FOREST PRODUCTS INDUSTRY TOUR (1) Field tour of local and regional forest products industries. Prerequisite: FORT 110, FORT 160
FORT 200 WOOD IDENTIFICATION AND PROPERTIES (1) Anatomy of wood and bark; cell wall formation and composition; and identifica- tion of wood by gross and microscopic qualities.
FORT 210 ARBORICULTURE (3) Selection, planting, care, and maintenance of woody ornamental plants and shade trees grown in urban, sub-urban, and rural landscapes. Prerequisite: second-year standing
FORT 220 FOREST ECOSYSTEM PROTECTION (4) Principles and concepts involved in managing the forest ecosystem in regard to fires, insects, and diseases.
FORT 230 AERIAL PHOTO INTERPRETATION (2) Aerial photo interpretation techniques applied to land management inventories, mapping, road location, and procurement. Prerequisite: FORT 130
FORT 240 FOREST SOILS AND HYDROLOGY (3) The study of forest soils and hydrology, especially as they are affected by forest management activities. Prerequisite: second-year standing
FORT 250 FOREST MANAGEMENT PRACTICES (3) Practical techniques for implementing management plans for forest stands under various ownerships and management regimes. Prerequisite: FORT 110, FORT 160

FORESTRY (FOR)

College of Agricultural Sciences

*FOR 137 INTRODUCTION TO HARVESTING (1) Field application of harvesting techniques, including sale layout and operation of hand and power equipment.
FOR 200W (W P) PROFESSIONAL CAREERS IN FOREST RESOURCES (3) Introduction to managing forests for products and services to meet human needs; developing career goals and an academic plan. Concurrent: FOR 203
FOR 203 FIELD DENDROLOGY (2) Field and laboratory identification of native and introduced trees and shrubs by leaf, fruit bud, twig, and bark.
FOR 203L (W P) FIELD DENDROLOGY AND ANATOMICAL PROPERTIES OF WOOD (3) Field and laboratory identification of native and introduced trees and shrubs by leaf, fruit, bud, twig, bark, and anatomical wood properties.
FOR 203P (W P) FIELD DENDROLOGY AND ANATOMICAL PROPERTIES OF WOOD Field and laboratory identification of native and introduced trees and shrubs by leaf, fruit, bud, twig, bark, and anatomical wood properties.
FOR 204 DENDROLOGY (2) Taxonomic and silvical characteristics, ranges, genetic relationships, and uses of important forest tree species. Prerequisite: FOR 203
+FOR 242 ELEMENTS OF PROJECT SUPERVISION IN FORESTRY (3) Supervisory techniques developed through an understanding of the behavioral sciences applied to field forestry personnel management.
*FOR 295 FOREST TECHNOLOGY INTERNSHIP (1–4) Supervised field experience related to the student's major. Prerequisite: approval of proposed assignment by instructor prior to registration
FOR 296 INDEPENDENT STUDIES (1–18)
FOR 297 SPECIAL TOPICS (1–9)
FOR 301 (HORT) PRINCIPLES OF ARBORICULTURE (3) Overview of the concepts and methods prescribed for the evaluation and care of large trees in urban settings. Prerequisite: BIOL 110 and SOILS 101
FOR 308 FOREST ECOLOGY (3) Effects of environment, spacing, and age on trees; forest influences; origin and development of forest communities. Prerequisite: or concurrent: FOR 203
FOR 320 FOREST FIRE MANAGEMENT (2) Principles and concepts involved in managing the forest ecosystem in regard to fire. Prerequisite: FOR 308
FOR 339 TIMBER HARVESTING SYSTEMS (3) Principles, concepts, and practices of safe and environmentally sound timber harvesting systems. Prerequisite: FOR 366
FOR 350 FOREST RESOURCES BIOMETRICS (3) Quantitative approaches for characterization and comparison of natural resources in forested landscapes. Prerequisite: ONE COURSE EACH IN CALCULUS, STATISTICS, AND COMPUTERS

FOR 366 FOREST RESOURCES MEASUREMENTS (4) Measurement systems used in forest management, wildlife management, water- shed management, urban forestry, and recreation management. Prerequisite: STAT 240
FOR 401 URBAN FOREST MANAGEMENT (3) Uses and values of urban vegetation, open space, and wildlife; planning, financing, support, management, and administration of urban forestry programs. Prerequisite: THREE CREDITS IN BUSINESS, MANAGEMENT, OR ECONOMICS AND SIX CREDITS IN BIOLOGY, FORESTRY, OR PLANT MATERIALS
FOR 409 TREE PHYSIOLOGY (2) Fundamentals of the relationship of the basic physiological functions of forest trees to form. Prerequisite: BIOL 240W
FOR 410 ELEMENTS OF FOREST ECOSYSTEM MANAGEMENT (3) Fundamentals of forest ecosystem management for goods and services. Prerequisite: 3 CREDITS IN BOTH ECOLOGY AND BIOLOGY
FOR 416 FOREST RECREATION (3) The management and administration of multiple-use forest lands and wilderness for forest recreational experiences, with emphasis on public forests. Prerequisite: 3 credits in social or behavioral sciences
FOR 418 AGROFORESTRY: SCIENCE, DESIGN, AND PRACTICE (3) Agroforestry integrates trees in agricultural landscapes, and/or agriculture products into forested areas for multiple benefits.
FOR 421 SILVICULTURE (3) The application of the principles of forest ecology to control of establishment, composition, and growth of forest stands. Prerequisite: FOR 308, FOR 366
FOR 430 (W F S) CONSERVATION BIOLOGY (3) The application of biological principles to issues in the conservation of biodiversity. Prerequisite: BIOL 220W or FOR 308
FOR 440 FOREST ECONOMICS AND FINANCE (3) The application of economic theory to forest resources systems, with emphasis on production and investment analyses. Prerequisite: ECON 002 or ECON 004
FOR 451 (AG) ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS FOR AGRICULTURE AND NATURAL RES OURCE MANAGEMENT (3) Application of artificial intelligence in agriculture and natural resources, with emphasis on expert systems. Prerequisite: ONE COURSE IN COMPUTER SCIENCE OR COMPUTER APPLICATIONS
FOR 455 REMOTE SENSING AND SPATIAL DATA HANDLING (3) Remote sensing systems, with emphasis on application to forest ecosystem analysis. Includes introduction to computer systems for spatial data handling. Prerequisite: MATH 110, 3 credits in computer science, 6 credits in ecological and/or geological sciences
FOR 466W FOREST RESOURCE MANAGEMENT (3) Optimum use of forest's tangible and intangible resources by application of financial and administrative management principles and management science techniques. Prerequisite: FOR 421 . Prerequisite or concurrent: FOR 440
FOR 470 WATERSHED MANAGEMENT (3) Management of wild land watersheds for control of the amount and timing of water yield, water quality, erosion, and sedimentation. Prerequisite: 3 credits in Soils
FOR 471 WATERSHED MANAGEMENT LABORATORY (1) Introduction to hydrologic and climatic measurements and computations useful in watershed management. Prerequisite: OR CONCURRENT: FOR 470
FOR 475 PRINCIPLES OF FOREST SOILS MANAGEMENT (3) Effect of current forest management practices on the properties and productive capacity of forest soils. Prerequisite: FOR 308, 3 credits in soils
FOR 480 POLICY AND ADMINISTRATION (3) Forest resources policy objectives; criteria and goals of society; policy implementation by ownership classes; planning, administration, and evaluation of programs. Prerequisite: FOR 200W, 3 credits of social or behavioral science
FOR 485 NATURAL RESOURCE DECISIONS (3) Application of previous courses and experience to decision making on forest land management and natural resource policy issues. (Students should have completed or be taking concurrently W F S 447, 463; FOR 410, 421, or 466.) Prerequisite: sixth-semester or higher standing, 12 credits in Forestry or Wildlife and Fisheries Sciences
FOR 488W INTERNATIONAL FORESTRY (3) Forestry in global context, emphasizing developing countries: ecological, economic, technological, and political aspects. Prerequisite: E R M 413W, FOR 421, OR INTAG 100
FOR 494 FORESTRY RESEARCH (3) Introduction to the theory, principles, and practices of forestry research; supervised research experience. Prerequisite: FOR 350, STAT 250
FOR 495 FORESTRY INTERNSHIP (1–6) Supervised field experience related to the student's major. Prerequisite: approval of proposed assignment by instructor prior to registration.
FOR 496 INDEPENDENT STUDIES (1–18)
FOR 497 SPECIAL TOPICS (1–9)
FOR 499 (GI) FOREIGN STUDIES (1–12)
*This course is offered only at the Mont Alto Campus as part of the two-year Forest Technology major.
+This course is offered only at the DuBois and Mont Alto Campus as part of the two-year Forest Technology and Wildlife Technology majors.

FRENCH (FR)

College of the Liberal Arts

FR 001 ELEMENTARY FRENCH I (4) Grammar, with reading and writing of simple French; oral and aural work stressed. Students who have received high school credit for two or more years of French may not schedule this course for credit, without the permission of the department.
FR 002 ELEMENTARY FRENCH II (4) Grammar and reading continued; oral and aural phases progressively increased. Students who have received high school credit for four years of French may not schedule this course for credit, without the permission of the department. Prerequisite: FR 001

FR 003 INTERMEDIATE FRENCH (4) Grammar, reading, composition, oral and aural exercises. Prerequisite: FR 002
FR 083S (GH;GI) FIRST-YEAR SEMINAR IN FRENCH (3) Critical approaches to the dimensions and directions in French/Francophone literatures and cultures.
FR 111 ELEMENTARY FRENCH (6) Acquisition of basic skills in the active use of French: listening, speaking, reading, and writing.
FR 112 INTERMEDIATE FRENCH (6) Reinforcement of basic skills previously acquired in the active use of French in FR 111.
FR 121G FUNDAMENTALS OF READING FRENCH (3) Instruction in fundamental skills required for reading expository French prose, primarily for research purposes. (This course may not be used to satisfy any baccalaureate degree requirements. No graduate credit is given for this course.) Prerequisite: seventh-semester standing
FR 122G PRACTICE IN READING FRENCH (3) Development and reinforcement of basic reading skills, with emphasis on the individual student's area of research. (This course may not be used to satisfy any baccalaureate degree requirements. No graduate credit is given for this course.) Prerequisite: FR 121G
FR 137 (GH;GI) PARIS: ANATOMY OF A CITY (3) Survey of the cultural, artistic, literary, and social life of the city of Paris from Gallo-Roman times to the present.
FR 138 (GH) FRENCH CULTURE THROUGH FILM (3) Introduction to French culture through film by French and francophone directors examining gender, ethnicity, and global issues. Taught in English.
FR 139 (GH;GI) FRANCE AND THE FRENCH-SPEAKING WORLD (3) An introduction to the culture of France and its impact on the world.
FR 140 FRENCH NOVEL IN ENGLISH TRANSLATION (1–6) Readings of selected French masterpieces in translation; discussion of recurring themes in several literary periods.
FR 141 CULTURAL TRADITION IN FRENCH CUISINE (3) A study of French culture in English, emphasizing the French gastronomical traditions in literature and civilization.
FR 142 (GH) FRENCH AND FRANCOPHONE LITERATURES IN TRANSLATION (3) An introduction to the literature of France and French-speaking countries.
FR 187 FRENCH FRESHMAN SEMINAR (3) The meaning and advantages of a Liberal Arts education in context of a specific discipline. Prerequisite: first-semester standing and enrollment in the College of the Liberal Arts
FR 197 SPECIAL TOPICS (1–9)
FR 199 (GI) FOREIGN STUDY—FRENCH (1–12) Intensive postintermediate grammar review, with emphasis on oral skills and vocabulary building. Prerequisite: FR 003
FR 201 ORAL COMMUNICATION AND READING COMPREHENSION (4) Emphasis on oral skills and reading for total comprehension. Prerequisite: FR 003
FR 202 GRAMMAR AND COMPOSITION (3) Grammar review and writing of short essays. Prerequisite: FR 003
FR 270 (WMNST) RACE AND GENDER IN LITERATURE TRANSLATED FROM FRENCH (3) A critical presentation, taught in English, of changing ideas and values on race and gender in French and Francophone literatures.
FR 294 RESEARCH PROJECT (1–12)
FR 296 INDEPENDENT STUDIES (1–18)
FR 297 SPECIAL TOPICS (1–9)
FR 299 (GI) FOREIGN STUDY—FRENCH (3–12) Writing practice at postintermediate level. Cultural readings about French civilization. Prerequisite: FR 199
FR 308 BUSINESS WRITING IN FRENCH (3) Common forms of business communication; writing of reports and abstracts. Prerequisite: FR 201, FR 202
FR 310 FRENCH PRESS (3) Extensive readings of several French daily and weekly newspapers and magazines. Prerequisite: FR 201, FR 202
FR 330 FRENCH CULTURE AND CIVILIZATION (3) French history and culture from the Middle Ages through the Third Republic. Prerequisite: FR 201, FR 202
FR 351 INTRODUCTION TO FRENCH LITERATURE I (3) Introduction to close textual reading and analysis of selected works of French literature from the middle ages to 1789. Prerequisite: FR 201, FR 202, FR 330
FR 352 INTRODUCTION TO FRENCH LITERATURE II (3) Introduction to close textual reading and analysis of selected works of French Literature from 1789 to the present. Prerequisite: FR 201, FR 202, FR 330
FR 395 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
FR 399 (GI) FOREIGN STUDY—FRENCH (3–12) Advanced training in the French language skills. Prerequisite: FR 201, FR 202
FR 401 ADVANCED ORAL COMMUNICATION (3) Emphasis on speaking and listening comprehension through discussion of current issues, using journalistic materials. Prerequisite: FR 201, FR 202
FR 402W ADVANCED GRAMMAR AND WRITING (3) Advanced study of the structure of the French language. Intensive essay writing. Prerequisite: FR 201, FR 202
FR 408 FRENCH-AMERICAN BUSINESS TRANSLATION (3) Translation from French to English of actual documents from the business world; theoretical consideration and systematic vocabulary building. Prerequisite: FR 308

FR 409 COMMERCIAL AND TECHNICAL TRANSLATION (3) Translation from English to French of commercial and technical materials; vocabulary building; writing of abstracts and summaries. Prerequisite: FR 402W
FR 416 INTRODUCTION TO FRENCH LINGUISTICS (3) Introduction to the theory and methods of linguistics as they apply to the major subfields.
FR 417 FRENCH PHONOLOGY (3) A formal study of the sound pattern of French. Prerequisite: FR 416
FR 418 FRENCH SYNTAX (3) A formal theory of word order and related issues in French grammar. Prerequisite: FR 201 and FR 202
FR 422 OLD FRENCH LITERATURE (3) Medieval masterpieces in original and modern French versions.
FR 426W FRENCH LITERATURE OF THE RENAISSANCE (3) Survey of key texts from sixteenth century France, with attention to historical and philosophical currents of French social thought.
FR 430 CONTEMPORARY FRANCE (3) Study of contemporary French society, politics, and culture from 1870 to the present. Prerequisite: FR 330
FR 434W CULTURE AND CUISINE (3) Interdisciplinary perspectives on the historical, political, and cultural dimensions of French food. Prerequisite: FR 330, FR 452, FR 460
FR 436W READINGS IN SEVENTEENTH-CENTURY FRENCH LITERATURE (3) Baroque and classicism: reappraisal of major and lesser-known 17th-century texts and theories.
FR 440 TEACHING OF ROMANCE LANGUAGES (3) Theories of second language acquisition. Current classroom practices in the teaching of Romance languages. Prerequisite: 15 credits beyond the elementary level
FR 445W SELF AND SOCIETY IN EIGHTEENTH-CENTURY FRANCE (3) The changing relationship of the individual to society in pre-Revolutionary France will be explored in texts by major writers. Prerequisite: FR 351 . Prerequisite or concurrent: FR 352
FR 452W NINETEENTH-CENTURY FRENCH LITERATURE (3) Selected readings in romanticism, realism, and symbolism, including Balzac, Stendhal, Sand, Baudelaire, and others, with emphasis on cultural issues.
FR 453W LA BELLE EPOQUE: POLITICS, SOCIETY, AND CULTURE IN FRANCE, 1880-1914 (3) Interdisciplinary perspectives on the politics, society, and culture of France, 1880-1914. Prerequisite: FR 330
FR 458 (GI) AFRICAN LITERATURE OF FRENCH EXPRESSION (3) Genesis of Franco-African literature in the 1930s; phases of the negritude movement; colonial and national literature.
FR 460 CONTEMPORARY FRENCH LITERATURE (3) Major authors and movements in French novel, drama, and poetry from Proust to the present.
FR 470 (GI) RACE AND GENDER ISSUES IN LITERATURES IN FRENCH (3) A critical presentation, taught in French, of changing ideas and values on race and gender in French and Francophone literatures. Prerequisite: FR 351 or FR 352
FR 471 (GI) FRANCOPHONE WOMEN IN LITERATURE AND CULTURE (3) Women's issues in literatures and cultures of French-speaking countries in Europe, the mediterranean, Africa, the Caribbean, and Quebec. Prerequisite: FR 351 or FR 352
FR 487 TOPICS IN FRENCH FILM HISTORY AND THEORY I: 1895-1945 (3) Provide background needed to understand the broad outlines of French film history and theory in their first fifty years (1895-1945). Prerequisite: FR 351 and FR 352 or COMM 250
FR 488 TOPICS IN FRENCH FILM HISTORY AND THEORY II: 1945-2002 (3) Provide background needed to understand the broad outlines of French film history and theory in their second half-century (1945-2002). Prerequisite: FR 351 and FR 352 or COMM 250
FR 489 FRENCH LITERATURE AND FILM (3) Comparison of artistic differences between selected pieces of French literature and their film adaptations.
FR 494 RESEARCH PROJECT (1–12)
FR 495 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
FR 496 INDEPENDENT STUDIES (1–18)
FR 497 SPECIAL TOPICS (1–9)
FR 499 (GI) FOREIGN STUDY—FRENCH (3–12) Advanced studies in French language and literature. Prerequisite: FR 201, FR 202

FRENCH STUDIES (FR ST)

College of the Liberal Arts

FR ST 497 SPECIAL TOPICS (1–9)

FUEL SCIENCE (F SC)

College of Earth and Mineral Sciences

F SC 012 ENERGY AND FUELS ENGINEERING LECTURE (1) Lectures and discussion by visiting engineers and faculty on energy and fuels engineering, job selection, patents, licensing, ethics, and other professional problems. Prerequisite: sixth-semester standing in Chemical Engineering (Energy & Fuels Engineering Option)
F SC 301 FUEL TECHNOLOGY (3) A detailed introduction to the principles involved in fuel science. Prerequisite: CHEM 013, MATSC 101, PHYS 211

F SC 401 INTRODUCTION TO FUEL TECHNOLOGY (3) An introduction to the scientific and engineering principles of fuel technology. For non-fuel science majors; fuel science majors will not receive credit. Prerequisite: CHEM 013, PHYS 211
F SC 410 FUEL SCIENCE LABORATORY (1–3) A comprehensive introduction to classic and modern laboratory skills and experimentation of relevance to fuel science practice. Prerequisite: F SC 401. Prerequisite or concurrent: ENGL 202C
F SC 416 (M E) INTRODUCTION TO COMBUSTION (3) Concepts related to laminar and turbulent premixed and nonpremixed combustion with applications to propulsion and stationary systems. Prerequisite: M E 023 or M E 030
F SC 422 COMBUSTION ENGINEERING (3) Principles of industrial combustion engineering; structure and stability of industrial flames; heat transfer; examples drawn from industrial applications. Prerequisite: F SC 301 OR F SC 401
F SC 430 AIR POLLUTANTS FROM COMBUSTION SOURCES (3) Generation of pollutants in combustion chambers; reduction by combustion control; pre–and postcombustion treatment of fuels and effluents. Prerequisite: seventh-semester standing in a technical major
F SC 431 THE CHEMISTRY OF FUELS (3) Nature and properties of fossil and other fuels, including aerospace, in relation to use; preparation of fuels; by-products; fuel analysis. Prerequisite: F SC 301 OR F SC 401
F SC 432 (CH E) PETROLEUM PROCESSING (3) A study of physical and chemical processes to convert crude oil into desired products with an outlook from present to future. Prerequisite: CHEM 038
F SC 435 (CH E) INDUSTRIAL ORGANIC CHEMISTRY (3) Chemistry and processes for producing organic chemicals and materials in existing and emerging new manufacturing sectors of organic chemical industry. Prerequisite: CHEM 038
F SC 464 DESIGN OF FUEL PROCESSING PLANTS (3) The course involves several design projects in Energy and Fuels Engineering. Prerequisite: seventh-semester standing in chemical engineering
F SC 494 RESEARCH PROJECT (1–12)
F SC 496 INDEPENDENT STUDIES (1–18)
F SC 497 SPECIAL TOPICS (1–9)

GEO-ENVIRONMENTAL ENGINEERING (GEOEE)

College of Earth and Mineral Sciences

GEOEE 402 INTRODUCTION TO PARTICLE SYSTEMS (1) Characteristics of particulate systems; particle modification processes; transport and flow in powders, dispersions and suspensions. Prerequisite: MATH 250 or MATH 251, PHYS 212
GEOEE 404 SURFACE AND INTERFACIAL PHENOMENA IN GEO-ENVIRONMENTAL SYSTEMS (2) Principles underlying surface and interfacial phenomena with application to mineral processing and geo-environmental systems. Prerequisite: or concurrent: EGEE 301 or MATSE 401; GEOEE 412
GEOEE 406 SAMPLING AND MONITORING OF THE GEO-ENVIRONMENT (3) Issues of sampling, analysis, monitoring and control techniques for effective environmental management in the extractive industries. Prerequisite: MN PR 301, MNG 401, P N G 411
GEOEE 408 CONTAMINANT HYDROLOGY (3) Groundwater flow and transport; agents of contamination; aquifer character–ization and remediation; case studies. Prerequisite: GEOSC 452
GEOEE 412 GEO-ENVIRONMENTAL ENGINEERING LABORATORY (1) A laboratory study of the principles involved in the characterization and remediation of process wastes. Those students who are scheduled for MN PR 413 may not take this course. Prerequisite: or concurrent: MN PR 301
GEOEE 427 POLLUTION CONTROL IN THE PROCESS INDUSTRIES (3) Development of multimedia pollution control strategies for the mineral, metallurgical processing, and fossil fuel industries. Prerequisite: or concurrent: CHEM 013, MATH 250 or MATH 251, MN PR 301
GEOEE 480 GEOENVIRONMENTAL ENGINEERING PROCESS DESIGN (3) An integrated problem-based learning experience that utilizes fundamental concepts covered in the curriculum to design a geo-environmental system. Prerequisite: GEOEE 427, minimum of seventh-semester standing in Environmental Systems Engineering
GEOEE 494 SENIOR THESIS (1–6) Independent research and/or design projects under the supervision of the interdisciplinary Environmental Systems Engineering program. Prerequisite: seventh-semester standing in Environmental Systems Engineering

GEOGRAPHY (GEOG)

College of Earth and Mineral Sciences

GEOG 010 (GN) PHYSICAL GEOGRAPHY: AN INTRODUCTION (3) Survey and synthesis of processes creating geographical patterns of natural resources, with application of basic environmental processes in resource management.
GEOG 020 (GS) HUMAN GEOGRAPHY: AN INTRODUCTION (3) Spatial perspective on human societies in a modernizing world; regional examples; use of space and environmental resources; elements of geographic planning.
GEOG 030 (GS) GEOGRAPHIC PERSPECTIVES ON HUMAN-ENVIRONMENT RELATIONS (3)

Introduction to theory, methods, history and contemporary issues in global and regional relationships between human activity and the physical environment.
GEOG 040 (GS;GI) WORLD REGIONAL GEOGRAPHY (3) Introduction to the world as an interdependent community built from unique and independent regions and nations.
GEOG 100 (GS) ECONOMIC GEOGRAPHY (3) The location of economic activity at both macro—and micro-regional levels on the earth's surface.
GEOG 102 (GH) THE AMERICAN SCENE (3) Historical perspectives on the social and cultural forces associated with the production of distinctive American landscapes.
GEOG 103 (GS) GEOGRAPHY OF DEVELOPING WORLD (3) Patterns of poverty in poor countries; conventional and non-conventional explanations; focus on solutions; case studies of specific regions.
GEOG 105 BIOGEOGRAPHY (3) Distribution of plants and animals on global, regional, and local scales; their causes and significance. Prerequisite: BIOL 011 or GEOG 010
GEOG 110 (GN) CLIMATES OF THE WORLD (3) Introduction to climatology, including principal processes of the global climatic system and their variation over space and time.
GEOG 115 (GN) LANDFORMS OF THE WORLD (3) Distribution of the world's landform features and mineral resources; their characteristics, causes, and significance. Practicum includes correlated field trips and laboratory studies.
GEOG 120 (GS) URBAN GEOGRAPHY (3) Urban growth and stagnation; location of cities and urban systems; intraurban spatial structure; contemporary American urban problems.
GEOG 121 (GS) MAPPING OUR CHANGING WORLD (3) Fundamental concepts of GIS, cartography, remote sensing, and GPS in the context of environmental and social problems.
GEOG 124 (GS) ELEMENTS OF CULTURAL GEOGRAPHY (3) Locational analysis of changes in non-Western cultures. Problems of plural societies, economic development, population growth, and settlement.
GEOG 128 (GS;DF) GEOGRAPHY OF INTERNATIONAL AFFAIRS (3) Contemporary international affairs in their geographical setting; geographic elements in the development of national power, political groupings, and international disputes.
GEOG 200 GEOGRAPHY OF PENNSYLVANIA (3) Physical and human geography of Pennsylvania and surrounding areas. Pennsylvania society and economy in the national and international context.
GEOG 297 SPECIAL TOPICS (1–9)
GEOG 298 SPECIAL TOPICS (1–9)
GEOG 321 CARTOGRAPHY—MAPS AND MAP CONSTRUCTION (3) The art and science of creating small-scale maps as a medium for communication and research. Prerequisite: GEOG 121
GEOG 330 COMPUTER-ASSISTED REGIONAL ANALYSIS (3) Computer-assisted regional analysis combines methods of geographic information systems (GIS) with regional approaches to environmental and development problem solving. Prerequisite: GEOG 121
GEOG 352 IMAGE ANALYSIS (3) Introduction to the basic principles of remote sensing, and the analysis of aerial and satellite data. Prerequisite: GEOG 121
GEOG 356 COMPUTING FOR THE EARTH SCIENCES (3) Computer algorithms and methods used in the earth sciences for analysis and manipulation of spatial data. Prerequisite: GEOG 121; CMPSC 101 or equivalent computer programming knowledge
GEOG 357 GEOGRAPHIC INFORMATION SYSTEMS (3) Principles and use of geographic information; emphasis is on data acquisition and techniques for computer-aided analysis. Prerequisite: GEOG 121
GEOG 401W HISTORICAL GEOGRAPHY OF NORTH AMERICA (3) Exploration, settlement, and changing patterns of human occupance from the seventeenth century to the 1930's. Prerequisite: 6 credits in geography or 6 credits in history
GEOG 402 CULTURAL AND ANTHROPOGEOGRAPHY (3) Courses and consequences of spatial differences in social and cultural behavior; world patterns, regional configurations, and interrelations with other geographic phenomena. Prerequisite: 6 credits in geography or 6 credits in anthropology
GEOG 404W THE AMERICAN SCENE: PART II (3) How Americans created a modern national landscape while spreading their national domain from the Appalachians to the Pacific. Prerequisite: 3 credits in geography or American history
GEOG 405 GEOGRAPHY OF POPULATION (3) Population patterns, emphasizing number and growth, distribution, densities, and movements in various regions of the earth. Prerequisite: 6 credits in earth sciences, history, or sociology
GEOG 406 HUMAN USE OF ENVIRONMENT (3) The human use of resources and ecosystems and social causes and consequences of environmental degradation in different parts of the world; development of environmental policy and management strategies. Prerequisite: GEOG 030
GEOG 407 (HIST) AMERICAN ENVIRONMENTAL HISTORY (3) The history of the ways Americans have used and thought about the environment since 1500. Prerequisite: GEOG 030, LARCH 003; and HIST 020 or HIST 021; or 6 credits in the humanities or social sciences
GEOG 408W HUMAN DIMENSIONS OF POTENTIAL GLOBAL WARMING (3) Human dimensions of global environmental change: human causes; human adaptations; and policy implications of potential global warming. Prerequisite: EARTH 002, GEOG 010 OR METEO 003; GEOG 030
GEOG 410 GEOGRAPHY OF WATER RESOURCES (3) Perspectives on water as a resource and hazard for human society; water resource issues in environmental and regional planning. Prerequisite: 6 credits in geography or natural sciences

GEOG 413 BEHAVIORAL APPROACHES TO GEOGRAPHY (3) Spatial behavior concepts; sociospatial ordering; territorial behavior; environmental cognition; intraurban migration; consumer behavior; conflict and spatial decision making. Prerequisite: 6 credits in geography or social science

GEOG 415W (GI) (WMNST) GENDER AND GEOGRAPHY (3) Description and explanation of the links between gender relations and spatial structures. Prerequisite: GEOG 020, GEOG 100, GEOG 120, WMNST 001, OR WMNST 187

GEOG 418 URBAN HISTORICAL GEOGRAPHY (3) Study of the development and transformation of the historical urban built environment. Prerequisite: 6 credits in geography, humanities, or social sciences

GEOG 419 URBAN SOCIAL ISSUES: STRUCTURES, PROBLEMS, AND POLICIES (3) Review urban social structure, social problems in urban areas, and policies aimed at alleviating those problems in North American cities. Prerequisite: GEOG 020, GEOG 100, GEOG 120, OR SOC 015

GEOG 420W METROPOLITAN ANALYSIS (3) Theory and practice of regional and metropolitan analysis. Prerequisite: ECON 002, ECON 004, GEOG 120, GEOG 121

GEOG 421W DYNAMIC CARTOGRAPHIC REPRESENTATION (3) Theory and practice of mapping and geo-representation in a hypermedia context. Applications in science, policy, travel, and education. Prerequisite: GEOG 321, GEOG 330, GEOG 352, GEOG 356, or GEOG 357

GEOG 422 APPLIED CARTOGRAPHIC DESIGN (3) Applied computer-assisted map production methods with emphasis on geographic information design and color use for multiple presentation media. Prerequisite: GEOG 321

GEOG 425 CARTOGRAPHIC INFORMATION SYSTEMS (3) Theory and methods for the application of computers to cartographic symbolization and design problems. Design of computer mapping packages. Prerequisite: GEOG 321, GEOG 356

GEOG 427 GEOGRAPHY OF THE SOVIET UNION (3) Analysis and interpretation of the spatial patterns of population distribution and economic development in the U.S.S.R. Prerequisite: 6 credits in geography or 6 credits in social sciences

GEOG 432W CLIMATIC CHANGE AND VARIABILITY (3) Theories and observations of past, present, and future climatic change and variability; introduction to techniques used in climatic change research. Prerequisite: GEOG 110 or METEO 003

GEOG 433W INTRODUCTION TO GLOBAL CLIMATIC SYSTEMS (3) Introduction to global atmospheric circulation, including tropical, midlatitude and polar subsystems; ocean, land, cryospheric and urban climatic systems and interactions. Prerequisite: GEOG 010 or METEO 003

GEOG 434 REGIONAL PHYSIOGRAPHY (3) Landform regions; geographic distribution, origin, relationships to human activity; emphasis on the United States and Canada. Practicum includes field work and map interpretation. Prerequisite: GEOG 115, GEOSC 001, OR GEOSC 020; 3 additional credits in geography

GEOG 435 FOREST GEOGRAPHY (3) This course studies processes that control spatial and temporal change in forests. Prerequisite: GEOG 010, GEOG 105; OR BIOL 220W

GEOG 435W FOREST GEOGRAPHY (3) This course studies processes that control spatial and temporal change in forests. Prerequisite: GEOG 010, GEOG 105; OR BIOL 220W

GEOG 437 SATELLITE CLIMATOLOGY (3) A discussion of the application of satellite data to current and planned large-scale climate experiments. Prerequisite: GEOG 352

GEOG 440W MEXICO (3) Physical, historical, and contemporary human geography of Mexico; explanation of distribution and interactions of climate, ecosystems, agriculture, industry, population, environmental and socioeconomic conditions. Prerequisite: 6 credits in social sciences

GEOG 442 REGIONAL SYSTEMS IN EUROPE (3) Spatial structure of regional and interregional systems. Methods of analysis of impact of space on economic, political, and social problems. Prerequisite: 6 credits in geography or 6 credits in social sciences

GEOG 443 GEOGRAPHY OF THE ORIENT (3) Regional study, mainly of China and Japan; emphasis on analyzing regions, human distribution, and the location of economic activities. Prerequisite: 6 credits in geography or 6 credits in social sciences

GEOG 444 AFRICAN RESOURCES AND DEVELOPMENT (3) Ecological and cultural factors in the geography of Africa; natural resources and development. Prerequisite: GEOG 010, GEOG 020, GEOG 030, or GEOG 124

GEOG 450 DEVELOPMENT OF GEOGRAPHIC THOUGHT (3) Survey of the evolution of Western geography from antiquity to the modern era. Foundations of contemporary geographical thought. Prerequisite: 9 credits in geography

GEOG 453 INTRODUCTION TO FIELD GEOGRAPHY (3) Introduction to the methods and techniques for collecting spatial data in physical, human, and environmental geography. Prerequisite: GEOG 121

GEOG 454 SPATIAL ANALYSIS I (3) Geographic measurement, scaling, and classification; analysis of spatial pattern and structure; geographic covariation and autocorrelation. Prerequisite: 6 credits in social science

GEOG 455 SPATIAL ANALYSIS II (3) Normative and probabilistic models of spatial behavior; adaptive systems in geographic space; interaction and system stability. Prerequisite: GEOG 454

GEOG 458 PRACTICAL APPLICATIONS IN GEOGRAPHIC INFORMATION SYSTEMS (3) Application of GIS tools with the objective of developing sufficient competence to permit use of these techniques in applied settings. Prerequisite: GEOG 357

GEOG 459 DIGITAL TERRAIN MODELS (3) Techniques for digital investigation of geomorphic landforms, including input and reformatting of source data. Prerequisite: GEOG 480

GEOG 460 POLITICAL GEOGRAPHY (3) Geographical foundations of political phemomena; significant geographic factors in growth and development of states, boundary problems, population distribution, colonies, and internal and international regional problems. Prerequisite: 6 credits in history or 6 credits in political science
GEOG 470 GEOGRAPHY OF THE GLOBAL ECONOMY (3) Focus on industrial location theory, factors in industrial location, studies of selected industries and problems of industrial development. Prerequisite: ECON 002, ECON 004, GEOG 100
GEOG 480 GEOSPATIAL INFORMATION MANAGEMENT (3) This course examines geospatial data representations and algorithmic techniques that apply to spatially-organized data in digital form. Prerequisite: any earth science computer application course; familiarization with databases and information systems
GEOG 481 GEOGRAPHIC INFORMATION SYSTEMS DESIGN AND EVALUATION (3) Design and evaluation of Geographic Information Systems and other forms of integrated spatial data systems. Prerequisite: GEOG 357
GEOG 481 GEOGRAPHIC INFORMATION SYSTEMS DESIGN AND EVALUATION (3) Design and evaluation of Geographic Information Systems and other forms of integrated spatial data systems. Prerequisite: GEOG 357
GEOG 495 INTERNSHIP (1–13)
GEOG 495A CARTOGRAPHY INTERNSHIP (1–10) Applied cartographic design and production projects at the Gould GEO-Center. Prerequisite: GEOG 321
GEOG 496 INDEPENDENT STUDIES (1–18)
GEOG 497 SPECIAL TOPICS (1–9)

GEOGRAPHY (GEOGR)

Capital College
GEOGR 122 APPLIED GEOGRAPHIC INFORMATION SYSTEMS (1) An introduction to GIS (Geographic Information Systems) with emphasis on applications and analysis. Prerequisite: or concurrent GEOG 121

GEOSCIENCES (GEOSC)

College of Earth and Mineral Sciences
GEOSC 001 PHYSICAL GEOLOGY (3) Earth processes and their effects on the materials, structure, and morphology of the earth's crust. Practicum includes field work, study of rocks, minerals, dynamic models, and topographic maps. (This course includes from one to several field trips for which an additional charge will be made to cover transportation.)
*GEOSC 002 (GN) HISTORICAL GEOLOGY (3) History of the earth and its life; fundamentals of evolution, correlation, and paleogeography; practicum includes field trips, study of geologic maps, geologic problems, and fossils, with emphasis on Appalachian geology. (This course includes from one to several field trips for which an additional charge will be made to cover transportation.)
GEOSC 004 MINERALOGY (3) Structure, properties, and occurrence of silicate minerals; igneous, sedimentary, and metamorphic rocks in hand specimen; modern methods of mineral identification. Prerequisite: CHEM 012 OR CHEM 017; GEOSC 001
GEOSC 010 (GN) GEOLOGY OF THE NATIONAL PARKS (3) Introduction to geology, geological change, and environmental hazards, as seen in the National Parks.
*GEOSC 020 (GN) PLANET EARTH (3) Nontechnical presentation of earth processes, materials, and landscape. Practicum includes field trips, study of maps, rocks, and dynamic models, introduction to geologic experimentation. (This course includes from one to several field trips for which an additional charge will be made to cover transportation.)
GEOSC 020L (GN) PLANET EARTH (3) Nontechnical presentation of earth processes, materials, and landscape. Practicum includes field trips, study of maps, rocks, and dynamic models, introduction to geologic experimentation. (This course includes from one to several field trips for which an additional charge will be made to cover transportation.)
GEOSC 020P (GN) PLANET EARTH Nontechnical presentation of earth processes, materials, and landscape. Practicum includes field trips, study of maps, rocks, and dynamic models, introduction to geologic experimentation. (This course includes from one to several field trips for which an additional charge will be made to cover transportation.)
*GEOSC 021 (GN) EARTH AND LIFE: ORIGIN AND EVOLUTION (3) Introduction to the origin and evolution of life on Earth from the perspective of geologic time and the fossil record.
GEOSC 040 (GN) THE SEA AROUND US (3) Introduction to marine sciences and the world ocean, including physical, chemical, biological, and geological aspects of oceanography.
GEOSC 040L (GN) THE SEA AROUND US (3) Introduction to marine sciences and the world ocean, including physical, chemical, biological, and geological aspects of oceanography.
GEOSC 040P (GN) THE SEA AROUND US Introduction to marine sciences and the world ocean, including physical, chemical, biological, and geological aspects of oceanography.
*GEOSC 071 PHYSICAL GEOLOGY FOR ENGINEERS (3) Principles of physical geology, with emphasis on the engineering point of view; practicum includes field work, study of rocks, minerals, dynamic models, and topographic maps. (This course includes from one to several field trips for which an additional charge will be made to cover transportation.) Prerequisite: CHEM 012
GEOSC 097 SPECIAL TOPICS (1–9)

GEOSC 109H (GN) EARTHQUAKES, NUCLEAR EXPLOSIONS, AND SOCIETY (3) The nature of earthquakes and nuclear explosions and the science and policy issues linking them.
GEOSC 110H (GN) THE SCIENCE OF GEMSTONES (3) An exploration of the geological uses of gems and of the physical and chemical properties underlying their brilliance and color. Prerequisite: high school chemistry and trigonometry
GEOSC 197, 297, 397, 497 SPECIAL TOPICS (1–9)
*GEOSC 200 GEOLOGY OF CAVES AND KARST (3) Geology and hydrology of carbonate terrains; cave origin; sedimentation processes in caves; water supply and land use in karst areas. (This course includes from one to several field trips for which an additional charge will be made to cover transportation.)
GEOSC 201 EARTH MATERIALS (4) Elements of crystallography and crystal chemistry; origin, occurrence, and identification of sedimentary, igneous, and metamorphic rocks and their minerals. This course has one or more required field trips for which a fee is charged to the student. Prerequisite: CHEM 012, third-semester standing. Prerequisite or concurrent: GEOSC 001 or GEOSC 020
GEOSC 202 CHEMICAL PROCESSES IN GEOLOGY (4) An in-depth examination of the application of chemical principles to geological processes. Prerequisite: GEOSC 001, MATH 140, third-semester standing. Prerequisite or concurrent: CHEM 015
GEOSC 203 PHYSICAL PROCESSES IN GEOLOGY (4) An in-depth examination of various physical processes that operate within and at the surface of the earth. Prerequisite: GEOSC 001, fifth-semester standing. Prerequisite or concurrent: PHYS 211
GEOSC 204 GEOBIOLOGY (4) An introduction to how biological processes and materials are used to solve geological problems. Prerequisite: BIOL 110; GEOSC 001 or GEOSC 020
GEOSC 228 DINOSAURS (3) Dinosaurs and other large Mesozoic reptiles; their morphology, stratigraphic and paleoenvironmental distribution, preservation, collecting, classification, lifestyles, origins, evolution, and extinction.
GEOSC 296, 496 INDEPENDENT STUDIES (1–18)
*GEOSC 303 INTRODUCTION TO ENVIRONMENTAL GEOLOGY (3) Origin of earth and earth materials; natural resources, geologic barriers and hazards, and relationships to human use of the environment. (This course includes from one to several field trips for which an additional charge will be made to cover transportation.)
GEOSC 310 EARTH HISTORY (4) The principles of stratigraphy and paleontology and their use, in combination with plate tectonics, in reconstructing the earth's history. This course has one or more required field trips for which a fee is charged to the student. Prerequisite: GEOSC 201
GEOSC 320 GEOLOGY OF CLIMATE CHANGE (3) Geologic evidence for climate change and mechanisms of change, especially from the Ice Age through the near future.
GEOSC 340 GEOMORPHOLOGY (3) Physical and chemical processes operating at the earth's surface and their resulting landforms. This course has one or more required field trips for which a fee is charged to the student. Prerequisite: GEOSC 001; fifth-semester standing
GEOSC 402W (GI) NATURAL DISASTERS (3) Case studies of the causes and consequences of natural disasters; analysis of disaster impact in different economic, cultural, and social conditions. Prerequisite: fourth-semester standing
GEOSC 410 MARINE BIOGEOCHEMISTRY (3) Exploration of the ways in which life influences and is influenced by chemical, physical, and geological processes in the ocean. Prerequisite: CHEM 013; EARTH 002 or GEOSC 001, GEOSC 020, GEOSC 040 or METEO 022
GEOSC 412 WATER RESOURCES GEOCHEMISTRY (3) Aqueous geochemistry of silica, alumina, carbonate minerals, and selected metals; organic species in water; isotope geochemistry applied to water. Prerequisite: CHEM 012, CHEM 013
GEOSC 413W TECHNIQUES IN ENVIRONMENTAL GEOCHEMISTRY (3) This course teaches techniques needed for the collection, chemical analysis, and data analysis of environmental geochemical measurements. This course has one or more required field trips for which a fee is charged to the student. Prerequisite: one of the following: C E 475, CHEM 402, GEOSC 202, GEOSC 412, SOILS 419
GEOSC 415 GEOCHEMISTRY (3) Element abundance and genesis, application of chemical principles to earth materials, element fractionation in geologic processes. Prerequisite: CHEM 013, GEOSC 004, OR GEOSC 201
GEOSC 416 STABLE AND RADIOACTIVE ISOTOPES IN GEOSCIENCES: INTRODUCTION (3) Discussions on theories for natural isotopic and element variations and their applications to the solution of geologic and cosmologic problems. Prerequisite: CHEM 012, CHEM 013, CHEM 014, CHEM 015; GEOSC 001 or GEOSC 020
GEOSC 418 (SOILS) SOIL ENVIRONMENTAL CHEMISTRY (4) Introduction to chemical constituents and processes occurring in soils. Topics include mineral weathering, soil solution chemistry and adsorption of solutes. Prerequisite: CHEM 013, SOILS 101
GEOSC 419 THE ORGANIC GEOCHEMISTRY OF NATURAL WATERS AND SEDIMENTS (3) Composition, sources, and fates of particulate and dissolved organic matter in natural environments; biogeochemical processes; organic geochemistry of anthropogenic contaminants. Prerequisite: CHEM 012, CHEM 013
GEOSC 424 PALEONTOLOGY AND FOSSILS (3) Concepts and precedures using fossils to solve problems in systematics, evolution, biostratigraphy, correlation, sedimentation, paleoecology, and global change. Prerequisite: GEOSC 001 or GEOSC 020

GEOSC 434 VOLCANOLOGY (3) Phenomena and products of volcanic eruptions; physical characteristics of lava and pyroclastic material. Prerequisite: GEOSC 004 or GEOSC 201

*GEOSC 439 PRINCIPLES OF STRATIGRAPHY (3) An introduction to the description and genesis of sedimentary rock bodies, the determination of their stratal geometries, and their correlation. (This course includes from one to several field trips for which an additional charge will be made to cover transportation.) Prerequisite: GEOSC 201

GEOSC 440 MARINE GEOLOGY (3) Chemical and physical processes affecting the topography and sediments of the sea floor. Prerequisite: fourth-semester standing

GEOSC 445 COASTAL GEOLOGY (4) A field course dealing with the processes operative in the environmental systems of a segment of the mid-Atlantic coast. Prerequisite: fifth-semester standing

GEOSC 451 ECONOMIC GEOLOGY (3) Introduction to the study of mineral deposits. Prerequisite: GEOSC 004 or GEOSC 201

GEOSC 452 INTRODUCTION TO HYDROGEOLOGY (3) Hydrologic cycle: occurrence, movement, quality, and quantity of groundwater; quantitative geologic and hydrologic methods; role of water in geologic processes. This course has one or more required field trips for which a fee is charged to the student. Prerequisite: CHEM 013; GEOSC 001, GEOSC 020, or GEOSC 071; and fifth-semester standing

GEOSC 454 GEOLOGY OF OIL AND GAS (3) Properties, origin, migration, and occurrence of oil and gas. This course has one or more required field trips for which a fee is charged to the student. Prerequisite: GEOSC 001

GEOSC 461 GEOLOGY OF NORTH AMERICA (3) Evolution of structural-stratigraphic framework of continent; interpretation of relevant data obtained from field, experimental, and geophysical observation. Prerequisite: GEOSC 001, GEOSC 020, or GEOSC 071

GEOSC 465 STRUCTURAL GEOLOGY (4) Effects and mechanics of deformation of the earth's crust; practicum includes field trips and studies of maps and structural problems. This course has one or more field trips for which a fee is charged to the student. Prerequisite: or concurrent: GEOSC 203, GEOSC 310

GEOSC 466 MECHANICS OF GEOLOGICAL MATERIALS (3) Stress and strain specification; fracture and flow in deformational environments; environmental rock deformation; anisotropy; shear and consolidation of particulate media. Prerequisite: GEOSC 465

GEOSC 470W INTRODUCTION TO FIELD GEOLOGY (3) Field interpretation of geologic features; principles and techniques of geologic mapping; interpretation of geologic maps and diagrams. This course has one or more required field trips for which a fee is charged to the student. Prerequisite: GEOSC 001; fifth-semester standing

GEOSC 472 GEOSCIENCES SUMMER FIELD SCHOOL (6) A capstone summer field course built around five mapping exercises of diverse geologic terranes in the Rocky Mountain states. Prerequisite: GEOSC 310, GEOSC 465

GEOSC 474 (BIOL) ASTROBIOLOGY (3) In depth treatment of principles/concepts of biochemical evolution, the origin/evolution of life; evaluation of distribution of life in the universe. Prerequisite: BIOL 110, CHEM 012

GEOSC 475W (METEO) GLOBAL BIOGEOCHEMICAL CYCLES (3) The study of earth's major global biogeochemical cycles (carbon, oxygen, nitrogen, phosphorus, and sulfur) in the context of the climate system. Prerequisite: MATH 110 and MATH 111, or MATH 140 and MATH 141, and CHEM 012

GEOSC 479 ADVANCED STRATIGRAPHY (3) Modern topics of sequence stratigraphy are addressed, with a heavy emphasis on field and laboratory data analysis and interpretation. Prerequisite: GEOSC 439

GEOSC 481 SOLID EARTH AND PLANETARY GEOPHYSICS (3) Structure, composition, origin, and evolution of the Earth and Solar System. Prerequisite: PHYS 204 or PHYS 214

GEOSC 483 ENVIRONMENTAL GEOPHYSICS (3) This course presents the principles and applications of the variety of techniques geophysicists use to address environmental problems. Prerequisite: PHYS 211, PHYS 212

GEOSC 484 GEOPHYSICAL SURVEYING (3) Principles and interpretation of seismic, gravity, magnetic, electric, and electromagnetic methods; applications to geologic, mining, petroleum, and engineering problems. Prerequisite: PHYS 213 or PHYS 214

GEOSC 487 ANALYSIS OF TIME SERIES (4) Nonstatistical approach to data analysis; spectral and correlation analysis; filter theory; signal-to-noise improvement applied to seismic problems. Prerequisite: CMPSC 201C or CMPSC 201F

GEOSC 488 AN INTRODUCTION TO SEISMOLOGY (4) An overview of the observations, methods, and frameworks used in seismogram analysis for earthquake and earth-structure investigations (includes laboratory). Prerequisite: MATH 140, MATH 141

GEOSC 489 DYNAMICS OF THE EARTH (4) Constitution and dynamics of the solid earth; mechanics and consequences of Plate Tectonic processes. Prerequisite: GEOSC 203, GEOSC 310, PHYS 211

GEOSC 494W SENIOR THESIS (1–4) Supervised student activities on research projects identified on an individual or small group basis. Prerequisite: seventh-semester standing

GEOSC 495 INTERNSHIP (1–18)

GEOSC 498 SPECIAL TOPICS (1–9)

GEOSC 499 (GI) FOREIGN STUDIES (1–12)

*This course contains from one to several field trips for which an additional charge will be made to cover transportation.

GERMAN (GER)

College of the Liberal Arts

GER 001 ELEMENTARY GERMAN I (4) Introduction to listening, speaking, reading, and writing with emphasis on the first two skills; cultural aspects through readings and videos.

GER 001G ELEMENTARY GERMAN FOR GRADUATE STUDENTS (3) Designed for students preparing to satisfy language requirements for advanced degrees.

GER 002 ELEMENTARY GERMAN II (4) Continuation of GER 001; further introduction of basic structures, culture, and development of four basic skills stressing aural-oral aspects. Prerequisite: GER 001

GER 002G ELEMENTARY GERMAN FOR GRADUATE STUDENTS (3) Continuation of GER 001G, with opportunity for reading in special fields.

GER 003 INTERMEDIATE GERMAN (4) Continued four-skill development with increased emphasis on reading, writing, and grammatical accuracy; culturally-oriented reading selections and videos. Students may receive credit for only one of the following: GER 003 or GER 008. Prerequisite: GER 002

GER 008 BUSINESS GERMAN (4) Introduction to Business German. Students may receive credit for only one of the following: GER 003 or GER 008. Prerequisite: GER 001, GER 002

GER 011 INTENSIVE BASIC GERMAN (6) Listening, speaking, reading, writing, basic structures and vocabulary of German. Taught on an accelerated basis. Students may receive credit for only one of the following: GER 001, 011, or 015.

GER 012 INTENSIVE INTERMEDIATE GERMAN (6) Continued skill development of structures and vocabulary; listening, speaking, reading, writing. Taught on an accelerated basis. Students may receive credit for only one of the following: GER 002, 003, 012, or 016. Prerequisite: GER 011

GER 015 READING GERMAN I (3) Survey of German grammar, with readings in technical prose for students whose programs permit only two semesters of foreign language. Students may receive credit for only one of the following: GER 001, 011, or 015.

GER 016 READING GERMAN II (3) Continuation of GER 015, with readings in the student's own field. Students may receive credit for only one of the following: GER 002, 012, or 016. Prerequisite: GER 015

GER 083S (GH;GI) FIRST-YEAR SEMINAR IN GERMAN (3) Germany's cultural past and present.

GER 099 (GI) FOREIGN STUDY—GERMAN (1–12) Courses offered in foreign countries by individual or group instruction.

GER 100 (GH;GI) GERMAN CULTURE AND CIVILIZATION (3) Culture and civilization of the German people from the Germanic migrations to the Nazi period. Conducted in English.

GER 120 (GH) THE FAUST THEME IN LITERATURE AND IN THE OTHER ARTS (3) Survey of the Faust theme in literature (Spiess, Marlowe, Goethe, Mann), book illustrations, music (Gounod), theater, film, and visual arts.

GER 143 (GH;GI) (RUS) THE CULTURE OF STALINISM AND NAZISM (3) The culture of Stalinist Russia and Nazi Germany in comparative perspective.

GER 150 (GH) MASTERPIECES OF GERMAN LITERATURE IN ENGLISH TRANSLATION (3) Major works and prominent authors, E.G. Nieblungenlied, Tristan, Lessing, Goethe, Schiller, Heine, Hauptmann, Hesse, Mann, Kafka, Boll, Grass, Frisch.

GER 157 (GH;GI) PENNSYLVANIA GERMANS: THE CULTURE OF THE SECTARIANS (3) Survey of the religious background, beliefs, social life, customs, education, and culture of the Pennsylvania German sectarians, especially the Amish. Conducted in English.

GER 175 (GH) GERMANIC HEROIC AND MEDIEVAL LITERATURE IN ENGLISH TRANSLATION (3) Germanic heroic and medieval courtly literature from 800 to 1350 focusing on the prevailing cultural, social, and legal conditions.

GER 187 GERMAN FRESHMAN SEMINAR (3) The meaning and advantages of a Liberal Arts education in context of a specific discipline. Prerequisite: first-semester standing and enrollment in the College of the Liberal Arts

GER 190 (GH) TWENTIETH-CENTURY GERMAN LITERATURE IN ENGLISH TRANSLATION (3) Works of such writers as Boll, Brecht, Durrenmatt, Frisch, Grass, Hesse, Kafka, Mann, Rilke, Weiss, and Wolf.

GER 195 (GH) MODERN GERMAN DRAMA AND THEATRE IN ENGLISH TRANSLATION (3) Plays and their stage realization by writers such as Brecht, Durrenmatt, Handke, Hauptmann, Kaiser, Schnitzler, Wedekind, and Weiss.

GER 197, 297, 497 SPECIAL TOPICS (1–9)

GER 199 (GI) FOREIGN STUDY—GERMAN (3–6) Intermediate training in German language skills. Prerequisite: GER 002

GER 200 (GH;GI) CONTEMPORARY GERMAN CULTURE (3) Germany since WWI, its politics, economics, society, arts, and educational system in the international context; conducted in English.

GER 201 CONVERSATION AND COMPOSITION (4) Continuation of GER 003; emphasis on reading, writing, and conversational skills; course utilizes short literary selections, a concise novel, videos. Prerequisite: GER 003 or GER 012

GER 208W BUSINESS GERMAN (4) Intermediate Business German. Prerequisite: GER 008

GER 215H INTENSIVE CONVERSATION AND COMPOSITION (4) Intensive practice in spoken and written German through readings, discussions, and composition. Prerequisite: GER 003 OR GER 012H

GER 245 (GH) THE VIKINGS (3) Focus on the history of the Vikings from 800 to 1400 as conveyed to us in mythology, literature, and archaeology. Conducted in English.

GER 294 RESEARCH PROJECT (1–12)
GER 296 INDEPENDENT STUDIES (1–18)
GER 299 (GI) FOREIGN STUDY—GERMAN (3–6) Advanced training in German language skills.
GER 301 INTERMEDIATE CONVERSATION AND COMPOSITION (3) Intensive practice in spoken and written German through readings, discussions, video, and composition. Prerequisite: GER 201
GER 302W INTERMEDIATE CONVERSATION AND COMPOSITION II (3) Continuation of oral and written practice in German with extensive work in composition. Prerequisite: GER 301
GER 308W GERMAN BUSINESS COMMUNICATION (3) Development of German commerce and industry; extensive practice in the major forms of business communications such as business correspondence. Prerequisite: GER 201
GER 310 INTRODUCTION TO THE STUDY OF GERMAN LITERATURE (3) History, methods, and the terminology of literary interpretation and analysis in German. Prerequisite: OR CONCURRENT: GER 301
GER 344 INTERMEDIATE GERMAN CULTURE (3) An overview of German culture from the Middle Ages to the present. Conducted in German. Prerequisite: Prerequisite or concurrent: GER 301 or GER 308W
GER 395 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
GER 399 (GI) FOREIGN STUDY—GERMAN (3–12) Advanced studies in German language and/or literature. Prerequisite: GER 201
GER 401 ADVANCED CONVERSATION AND COMPOSITION (3) Study and practice of techniques of idiomatic style in speech and writing through oral reports, intensive composition practice and translation. Prerequisite: GER 302W
GER 408 ADVANCED GERMAN BUSINESS COMMUNICATIONS (3) Study of German business organization, forms of business communications, business terminology; writing of reports and abstracts. Prerequisite: GER 308
GER 411 THE TEACHING OF GERMAN (3) Theory, methods, techniques, materials, bibliography; use of inter-active media; contributions of linguistics or psychology to language learning. Prerequisite: or concurrent: GER 401
GER 412 CONTRASTIVE ANALYSIS OF MODERN GERMAN AND ENGLISH (3) Structural comparison of the German and English grammatical systems: morphology, syntax, phonology. Prerequisite: or concurrent: GER 401
GER 420 GENRE (3–9) Special studies in a particular literary genre in German literature, such as lyrical poetry, drama, or narrative prose. Prerequisite: GER 310, GER 401
GER 430 HISTORY OF THE GERMAN LANGUAGE (3) Development of German as a literary language from its earliest stages, including historical and cultural aspects; conducted in English. Prerequisite: or concurrent: GER 401
GER 431 HISTORY OF GERMAN LITERATURE AND CULTURE I (3) Significant works of German literature before the mid-eighteenth century considered in their cultural context. Prerequisite: GER 310 . Prerequisite or concurrent: GER 401
GER 432 HISTORY OF GERMAN LITERATURE AND CULTURE II (3) Significant works of German literature from the mid-eighteenth century to the present considered in their cultural context. Prerequisite: GER 310 . Prerequisite or concurrent: GER 401
GER 440 SEMINAR IN GERMAN CULTURE (3–6) Seminar devoted to a special topic in the field of German culture and civilization. Prerequisite: or concurrent: GER 401
GER 452 LITERATURE OF THE RENAISSANCE (3) German literature of the late Middle Ages, Humanism and Reformation including such writers as Brant, Erasmus, Fischart, Luther, Sachs. Prerequisite: or concurrent: GER 431 or GER 432
GER 460 LITERATURE OF THE BAROQUE (3) The literature and literary movements of seventeenth-century Germany, including such writers as Opitz, Fleming, Gryphius, Hofmannswaldau, and Gunther. Prerequisite: or concurrent: GER 431 or GER 432
GER 461 LITERATURE OF THE ENLIGHTENMENT (3) Lessing and his contemporaries; new currents in German literature of the eighteenth century. Prerequisite: or concurrent: GER 431 or GER 432
GER 462 LITERATURE OF THE LATE EIGHTEENTH CENTURY (3) Literature of the period of Empfindsamkeit and Sturm und Drang, including Rococo and Anacreontic tendencies. Prerequisite: or concurrent: GER 431 or GER 432
GER 470 GOETHE (3) A study of Goethe's life and works especially his lyric poetry, novels, and dramas. Prerequisite: or concurrent: GER 431 or GER 432 .
GER 471 SCHILLER (3) Schiller's life, his classical poetry, aesthetic essays, and major dramas. Prerequisite: or concurrent: GER 431 or GER 432
GER 472 ROMANTICISM (3) A study of both early and late romanticism, including such writers as Novalis, the Schlegels, E.T.A. Hoffmann, and Heine. Prerequisite: or concurrent: GER 431 or GER 432
GER 480 REALISM (3) Literature of the nineteenth century from Biedermeier through Jenges Deutschland to realism: Grillparzer, Morike, Buchner, Heine, Hebbel, Keller, Storm, Fontane. Prerequisite: or concurrent: GER 431 or GER 432
GER 481 EARLY TWENTIETH CENTURY (3) Development of German literature from Naturalism through Jugendstil to Expressionism: George, Hauptmann, Hesse, Hofmannsthal, Holz, Kafka, Kaiser, Mann, Rilke, Toller. Prerequisite: or concurrent: GER 431 or GER 432

GER 482 GERMAN LITERATURE FROM 1933 TO THE PRESENT (3) Literature from 1933 to the present including Exile and GDR literature. Prerequisite: or concurrent: GER 431 or GER 432
GER 494 RESEARCH PROJECT (1–12)
GER 495 INTERNSHIP (3–9)
GER 496 INDEPENDENT STUDIES (1–18)
GER 499 (GI) FOREIGN STUDY—GERMAN (3–12) Advanced studies in German language, literature, and culture. Prerequisite: any 300-level course in German

GREEK (GREEK)

College of the Liberal Arts;
Knowledge of Greek or Latin not required. *See also CLASSICS AND ANCIENT MEDITERRANEAN STUDIES and LATIN.*
001 ELEMENTARY CLASSICAL AND NEW TESTAMENT GREEK (4) Pronunciation, forms, syntax, and translation.
GREEK 002 ELEMENTARY CLASSICAL AND NEW TESTAMENT GREEK (4) Further instruction in syntax and sentence structure. Prerequisite: GREEK 001
GREEK 003 INTERMEDIATE CLASSICAL AND NEW TESTAMENT GREEK (4) Selections from representative authors. Prerequisite: GREEK 002
GREEK 099, 199, 299, 399, 499 (GI) FOREIGN STUDIES (1–12)
GREEK 101 INTRODUCTORY ANCIENT GREEK (4) Fundamentals of classical Greek grammar, syntax, and vocabulary.
GREEK 102 INTERMEDIATE ANCIENT GREEK (4) Intermediate study of classical Greek grammar, syntax, and vocabulary. Prerequisite: GREEK 101
GREEK 197, 297, 397, 497 SPECIAL TOPICS (1–9)
GREEK 294, 494 RESEARCH PROJECT (1–12)
GREEK 296, 496 INDEPENDENT STUDIES (1–18)
GREEK 395 INTERNSHIP (1–18)
GREEK 401 INTRODUCTORY READING IN GREEK LITERATURE (3–6) Analysis of selected passages of ancient Greek literature; attention will be paid to grammatical as well as literary details. Prerequisite: GREEK 003 or GREEK 102
GREEK 420 GREEK PROSE AUTHORS (3–6) Readings in representative authors. Prerequisite: GREEK 003
GREEK 425 GREEK HISTORIANS (3–6 per semester) Translation and study of one or more of the ancient Greek historians. Prerequisite: GREEK 003 or GREEK 102
GREEK 430 GREEK POETRY (3–6 per semester) Translation and analysis of selected readings in Greek poetry. Prerequisite: GREEK 003 or GREEK 102
GREEK 440 GREEK DRAMA (3–6) Translation and study of a selected play. Prerequisite: GREEK 003 or GREEK 102

HEALTH (HLTH)

Capital College
HLTH 306 PHYSICAL EDUCATION, HEALTH, AND SAFETY IN ELEMENTARY SCHOOLS (2) A study of appropriate activities for elementary-age children. Student participation in physical activities is required. Prerequisite: eighth-semester standing in Elementary Education Program

HEALTH ADMINISTRATION (H ADM)

Captial College
H ADM 486 (P ADM) APPLIED STATISTICAL PACKAGES (1) Selection and application of computer packages for statistical analysis, construction and modification of files, design of program statements. Prerequisite: 3 credits of statistics

HEALTH CARE MANAGEMENT (H C M)

Capital College
H C M 361 HEALTH CARE SYSTEMS (3) An analysis of health care-related occupations, use of health services and health care system. Discussion of alternatives to present system.
H C M 462 HEALTH CARE ADMINISTRATION (3) Organizational perspectives, managerial techniques and political aspects of health care planning, administration and control. Prerequisite: H C M 361
H C M 463 LEGAL ASPECTS OF HEALTH CARE (3) An examination of legal rights and liabilities of patients, professionals, and health care institutions. Emphasis is given to medical malpractice.
H C M 464 HEALTH CARE FINANCE AND ECONOMICS (3) Integration of financial and economic aspects of health care systems, including financing, mechanisms, economic theory, and regulatory constraints. Prerequisite: FINAN 320, 6 credits economics (micro and macro)
H C M 465 HEALTH CARE INSURANCE (3) A study of insurance as it relates to health care from the public and private sector viewpoints.
H C M 467 METHODS OF HEALTH CARE PLANNING AND EVALUATION (3) Health care planning, epidemiological concepts, forecasting procedures, and methods of health care evaluation. Prerequisite: 3 credits in statistics

H C M 495 INTERNSHIP (1–18)
H C M 496 INDEPENDENT STUDIES (1–18)
H C M 497 SPECIAL TOPICS (1–9)

HEALTH EDUCATION (HL ED)

College of Health and Human Development
HL ED 496 INDEPENDENT STUDIES (1–18)
HL ED 497, 498 SPECIAL TOPICS (1–9)

HEALTH EDUCATION (HLHED)

Capital College
HLHED 415 PLANNING AND DEVELOPING HEALTH EDUCATION PROGRAMS (3) Premises and strategies for planning, implementing, and evaluating wellness programs in corporate, hospital, and community agency settings. Prerequisite: permission of program
HLHED 420 DEVELOPMENT OF STRESS MANAGEMENT PROGRAMS FOR HEALTH EDUCATION (3) Planning, development, and implementing strategies for stress management programs for health education professionals in school, community, and corporate settings. Prerequisite: permission of program
HLHED 421 INTEGRATING HEALTH EDUCATION INTO THE SCHOOL PROGRAM K–12 (3) Premises and strategies for integrating basic health education concepts into the school program K–12. Prerequisite: permission of program
HLHED 443 ALCOHOL AND DRUG EDUCATION (3) Principles of integration and coordination of alcohol and drug education programs for health education and other social service professions. Prerequisite: permission of program
HLHED 450 WORKSITE HEALTH PROMOTION (3) Rationale and strategies for planning, implementing, and evaluating employee health promotion in programs in public and private worksite settings. Prerequisite: permission of program
HLHED 456 ADVANCED TECHNIQUES IN SCHOOL AND COMMUNITY HEALTH EDUCATION (3) Public health, mental health, nutrition, dental school health, physical education, accident prevention, health teaching; projects, consultation, visitation, discussions, and resources. Prerequisite: permission of program
HLHED 497 SPECIAL TOPICS (1–9)

HEALTH AND HUMAN DEVELOPMENT (H & HD)

College of Health and Human Development
H&HD 297, 497 SPECIAL TOPICS (1–9)
H&HD 497H SPECIAL TOPICS—HONORS (1–9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
H&HD 499 (GI) FOREIGN STUDIES (1–12)
H&HD 499H (GI) FOREIGN STUDIES—HONORS (1–12)

HEALTH POLICY AND ADMINISTRATION (H P A)

College of Health and Human Development
H P A 057 (GHS) CONSUMER CHOICES IN HEALTH CARE (3) Introduction to consumers' role in health-care decisions, including health benefits, physician and hospital choice, and end-of-life choices.
H P A 101 INTRODUCTION TO HEALTH SERVICES ORGANIZATION (3) Examination of the social, political, historic, and scientific factors in the development and organization of health services.
H P A 296 INDEPENDENT STUDIES (1–18)
H P A 297 SPECIAL TOPICS (1–9)
H P A 301 HEALTH SERVICES POLICY ISSUES (3) Analysis of major issues in health services delivery in hospitals, medical practice, public health, mental health, and health professional education. Prerequisite: H P A 101, PL SC 001, ECON 002
H P A 301W HEALTH SERVICES POLICY ISSUES (3) Analysis of major issues in health services delivery in hospitals, medical practice, public health, mental health, and health professional education. Prerequisite: ECON 002, H P A 101, PL SC 001
H P A 310 HEALTH CARE AND MEDICAL NEEDS (3) Health care from an individual, family, and community standpoint illustrated with specific diseases and health problems. Prerequisite: BB H 101, BI SC 004, or BIOL 141
H P A 332 HEALTH SYSTEMS MANAGEMENT (3) Introduction to and analysis of managerial roles and practices in health service organizations. Prerequisite: H P A 101
H P A 390 PROFESSIONAL DEVELOPMENT IN HEALTH POLICY AND ADMINISTRATION (3) Development of personal understanding and professional skills to prepare students for future employment or study in health policy and administration. Prerequisite: H P A 101
H P A 390W PROFESSIONAL DEVELOPMENT IN HEALTH POLICY AND ADMINISTRATION (3) Development of personal understanding and professional skills to prepare students for future employment or study in health policy and administration. Prerequisite: H P A 101

H P A 395 FIELD EXPERIENCE IN HEALTH POLICY AND ADMINISTRATION (1–13) Professional field experience providing opportunities to apply skills and knowledge in health care setting. Prerequisite: H P A 301W, H P A 310, H P A 332, H P A 390

H P A 396 PROFESSIONAL TRANSITION TO CAREERS IN HEALTH POLICY AND ADMINISTRATION (1) Professional skills development preparing students for their first work experience in Health Policy and Administration. Prerequisite: H P A 395

H P A 401 COMPARATIVE HEALTH SYSTEMS (3) Comparative analysis of health services in selected developed and developing countries. Prerequisite: H P A 301

H P A 410 PRINCIPLES OF PUBLIC HEALTH ADMINISTRATION (3) The rationale for, and the patterns of, public health service at all levels of government in the United States. Prerequisite: H P A 301

H P A 420 PRINCIPLES OF MANAGED CARE (3) Survey of managed health care, including history, typology, current issues, management challenges, and impacts on patients, providers, and special populations. Prerequisite: H P A 301

H P A 431 HEALTH PLANNING METHODS (3) Introduction to methods used in planning for health, services, facilities, and manpower. Prerequisite: H P A 301; STAT 200 or STAT 250

H P A 433 ADMINISTRATION OF HOSPITAL AND HEALTH SERVICE SYSTEMS (3) Analysis of administrative structures and interorganizational arrangements among hospitals and other health care organizations. Prerequisite: H P A 332

H P A 440 (BB H) PRINCIPLES OF EPIDEMIOLOGY (3) Theory of epidemiology and significant case studies. Potential application to health care. Prerequisite: BB H 101 or BIOL 110 or H P A 310; STAT 200 or STAT 250

H P A 442 LONG-TERM CARE MANAGEMENT (3) Management and policy issues for institutional, community, and home settings for chronic care services. Prerequisite: H P A 332

H P A 445 (ECON) HEALTH ECONOMICS (3) Economic analysis of U.S. health care system; planning, organization, and financing; current public policy issues and alternatives. Prerequisite: ECON 302, ECON 315, or ECON 323

H P A 447 FINANCING HEALTH CARE (3) Analysis of financial flows, third party payment programs, and reimbursement practices in the health services sector. Prerequisite: FIN 100 or INS 301; H P A 301 or H P A 332.

H P A 450 HEALTHCARE POLICIES AND POLITICS (3) Survey of health care's political contexts: formulation, implementation, and modification stages of policy process; politics of private interests (associations) at national and state levels. Prerequisite: H P A 101, H P A 301, PL SC 001

H P A 455 STRATEGIC PLANNING AND MARKETING FOR HEALTH SERVICES (3) Introduction to principles and methods of strategic planning and marketing. Prerequisite: H P A 332

H P A 457 CONSUMER HEALTH EDUCATION (3) Orientation of school and community health education opportunities to the consumer task of selecting health products and services. Prerequisite: 9 credits of health science and/or psychology

H P A 460 HUMAN RESOURCE MANAGEMENT IN HEALTH CARE ORGANIZATIONS (3) Foundations of human resource management applied to health care organizations, including hospitals, long-term care facilities, and community health organizations. Prerequisite: H P A 332

H P A 470 HEALTH CARE INFORMATION MANAGEMENT (3) This course introduces information systems terminology, data structures, software applications, and their management functions in health services organizations. Prerequisite: H P A 332, IST 210, IST 220

H P A 496 INDEPENDENT STUDIES (1–18)

H P A 497 SPECIAL TOPICS (1–9)

HEBREW (HEBR)

College of the Liberal Arts

HEBR 001 BASIC MODERN HEBREW I (4) An introduction to modern Hebrew in its written and spoken forms; oral and aural work stressed.

HEBR 002 BASIC MODERN HEBREW II (4) Continued study of grammar; emphasis on improving oral-aural facility, with increased attention to reading and writing. Prerequisite: HEBR 001

HEBR 003 INTERMEDIATE MODERN HEBREW (4) Grammar, reading, composition, and oral and aural exercises. Prerequisite: HEBR 002

HEBR 010 (GH;GI) (J ST) JEWISH CIVILIZATION (3) Life of the Jewish people from Biblical times, emphasizing cultural, religious, and institutional developments.

HEBR 097, 197, 297, 397,497, 498 SPECIAL TOPICS (1–9)

HEBR 099, 199, 299, 399, 499 (GI) FOREIGN STUDIES (1–12)

HEBR 110 CONVERSATION, READING, AND COMPOSITION (3) Oral and written expression; aspects of Israeli culture and civilization. Prerequisite: HEBR 003

HEBR 111 THE DEVELOPMENT OF HEBREW LANGUAGE AND LITERATURE (3) Chronological overview of Hebrew language and literature; characteristics of the language in the Biblical, Mishnaic, Medieval, Modern eras; representative readings. Prerequisite: HEBR 003

HEBR 187 HEBREW FRESHMAN SEMINAR (3) The meaning and advantages of a Liberal Arts education in context of a specific discipline. Prerequisite: first-semester standing and enrollment in the College of the Liberal Arts

HEBR 294, 494 RESEARCH PROJECT (1–12)
HEBR 295 INTERNSHIP (1–18)
HEBR 296, 496 INDEPENDENT STUDIES (1–18)
HEBR 395 INTERNSHIP (1–18)
HEBR 401 ADVANCED HEBREW—CONVERSATION EMPHASIS (3–6) Development of oral proficiency through discussions focusing on issues in contemporary Jewish culture. Prerequisite: HEBR 110
HEBR 402 ADVANCED HEBREW—READING EMPHASIS (3–6) Readings in representative works of traditional and modern literature; practice in composition; study of aspects of Jewish culture. Prerequisite: HEBR 110

HIGHER EDUCATION (HI ED)

College of Education
HI ED 101 PSU STUDENTS AND THEIR UNIVERSITY (3) An opportunity for undergraduates to investigate, in small informal groups, governance, curricula, and student life at Penn State and elsewhere.
HI ED 497, 498 SPECIAL TOPICS (1–9)

HISTORY (C HIS)

Capital College
C HIS 320 CONTEMPORARY WORLD HISTORY AND ISSUES (3) A survey of global history in the twentieth century and study of selected trends and controversies.
C HIS 320W CONTEMPORARY WORLD HISTORY AND ISSUES (3) A survey of global history in the twentieth century and study of selected trends and controversies.
C HIS 325 (WOMST) WOMEN IN MODERN HISTORY (3) Status, roles, and activities of women since 1700; focus on Europe and selected non-Western areas.
C HIS 405 PERIODS IN INTELLECTUAL AND CULTURAL HISTORY (3 per semester) Historical study of the ideas, values, and forms of expression of a particular era. (May be repeated for credit.)
C HIS 440 TOPICS IN EUROPEAN HISTORY (3 per semester) Study of a particular period or country in European history, its significance and relation to other areas and the present. (May be repeated for credit.)
C HIS 460 STUDIES IN HISTORICAL WRITING (3) Study of selected interpretations of history and biography, including literary and psychological explanations.
C HIS 496 INDEPENDENT STUDIES (1–18)
C HIS 497 SPECIAL TOPICS (1–9)

HISTORY (HIST)

College of the Liberal Arts
HIST 001 (GH) THE WESTERN HERITAGE I (3) A survey of the Western heritage from the ancient Mediterranean world to the dawn of modern Europe.
HIST 001T (GH) THE WESTERN HERITAGE I (3) A survey of the Western heritage from the ancient Mediterranean world to the dawn of modern Europe.
HIST 002 (GH) THE WESTERN HERITAGE II (3) A survey of the Western heritage from the dawn of modern Europe in the seventeenth century to the present.
HIST 002S THE WESTERN HERITAGE II (3) A survey of the Western heritage from the dawn of modern Europe in the seventeenth century to the present.
HIST 003 (GH) THE AMERICAN NATION: HISTORICAL PERSPECTIVES (3) American history from discovery to the present, focusing on both racial, ethnic, and religious differences and shared traditions and ideals.
HIST 010 (GH;GI) WORLD HISTORY I (3) Human origins; early civilizations; major political and intellectual developments on all continents; cultural interrelationships to 1500.
HIST 011 (GH;GI) WORLD HISTORY II (3) Social, economic, and political evolution of societies and cultures from 1500 to the present.
HIST 012 (GH) HISTORY OF PENNSYLVANIA (3) Chronological and topical survey, emphasizing immigration of diverse ethnic groups and religious, political, economic, and social developments, including industrialization and urbanization.
HIST 020 (GH) AMERICAN CIVILIZATION TO 1877 (3) An historical survey of the American experience from its colonial beginnings through the Civil War and Reconstruction.
HIST 020W (GH) AMERICAN CIVILIZATION TO 1877 (3) An historical survey of the American experience from its colonial beginnings through the Civil War and Reconstruction.
HIST 021 (GH) AMERICAN CIVILIZATION SINCE 1877 (3) An historical survey of the American experience from the emergence of urban- industrial society in the late nineteenth century to the present.
HIST 021W (GH) AMERICAN CIVILIZATION SINCE 1877 (3) An historical survey of the American experience from the emergence of urban- industrial society in the late nineteenth century to the present.
HIST 083S (GH) FIRST-YEAR SEMINAR IN HISTORY (3) Critical approaches to the dimensions and directions in History.
HIST 084S (GS) FIRST-YEAR SEMINAR IN HISTORY (3) Critical approaches to the dimensions and directions in History.
HIST 100 (GH) (CAMS) ANCIENT GREECE (3) Greek world from the earliest Aegean cultures to the death of Alexander the Great and the beginnings of Hellenistic civilization.

HIST 100S (GH) ANCIENT GREECE (3) Greek world from the earliest Aegean cultures to the death of Alexander the Great and the beginnings of Hellenistic civilization.
HIST 101 (GH) (CAMS) THE ROMAN REPUBLIC AND EMPIRE (3) History of the Roman Republic and Empire from the origins of Rome to the disintegration of the Empire.
HIST 101S (GH) THE ROMAN REPUBLIC AND EMPIRE (3) History of the Roman Republic and Empire from the origins of Rome to the disintegration of the Empire.
HIST 102 (GH;GI) (CAMS;J ST;RL ST) CANAAN AND ISRAEL IN ANTIQUITY (3) Political, social, and intellectual history of the land of Canaan/Israel in the Biblical era: Late Bronze and Iron Ages.
HIST 103 (GH;GI) THE HISTORY OF MADNESS, MENTAL ILLNESS, AND PSYCHIATRY (3) This course will examine the ideas that have shaped European and American perceptions of madness, insanity, and mental illness.
HIST 104 (GH) (CAMS) ANGIENCT EGYPT (3) The history and archaeology of ancient Egypt from the dawn of history to the Greco-Roman period.
HIST 105 (GH) THE BYZANTINE EMPIRE (3) Development of Byzantine civilization from the decline of the Roman Empire to the fall of Constantinople.
HIST 107 (GH) (MEDVL) MEDIEVAL EUROPE (3) Rise and development of the civilization of medieval Europe from the decline of Rome to 1500.
HIST 108 (GH) THE CRUSADES: HOLY WAR IN THE MIDDLE AGES (3) The social and political history of medieval religious warfare in Europe and in the Middle East.
HIST 110 (GH;GI) NATURE AND HISTORY (3) A broad introduction to the history of human relationships with nature throughout the world.
HIST 116 (GS) (WMNST) FAMILY AND SEX ROLES IN MODERN HISTORY (3) Historical perspectives on the Western family since 1500: gender roles, marriage, sexuality, child rearing, and old age; emphasis on United States.
HIST 117 (GH;GI) (WMNST) WOMEN IN MODERN HISTORY (3) Modernization and women: changing images and roles since mid-eighteenth century in the family, workshop, politics, society; cross-cultural comparisons.
HIST 118 (J ST) MODERN JEWISH HISTORY: 1492 TO PRESENT (3) Jewish social and political history from 1492 to the present.
HIST 120 (GS) EUROPE SINCE 1848 (3) Political, social, and ideological developments; origin and impact of two World Wars; totalitarianism and democracy; changing role in the world.
HIST 121 (GH;GI) (J ST) HISTORY OF THE HOLOCAUST 1933-1945 (3) Historical analysis of holocaust themes.
HIST 122 (GH) (S T S) HISTORY OF SCIENCE I (3) A history of science and culture from Stonehenge to the scientific revolution.
HIST 123 (GH) (S T S) HISTORY OF SCIENCE II (3) A history of science and culture from the scientific revolution to the present.
HIST 130 INTRODUCTION TO THE CIVIL WAR ERA, 1848 THROUGH 1877 (3) Survey of causes and consequences of American Civil War, end of Mexican War in 1848 through end of Reconstruction, 1877.
HIST 141 (GH) MEDIEVAL AND MODERN RUSSIA (3) Introductory survey, including political, social, economic, and cultural development of Kievan, Muscovite, and Imperial Russia.
HIST 142 (GS) HISTORY OF COMMUNISM (3) Marxism; Leninism and evolution of the Soviet Union; formation and development of the Communist bloc; impact of Chinese Communism.
HIST 143 (GH) HISTORY OF FASCISM AND NAZISM (3) The study of right-wing totalitarianism in the twentieth century, with special emphasis on Fascist Italy and Nazi Germany.
HIST 144 THE WORLD AT WAR: 1939-1945 (3) In-depth study of the origins and conduct of World War II. Political and economic aspects as well as military.
HIST 150 COLONIAL PENNSYLVANIA (3) Development of the colony of Pennsylvania through the war for American independence, covering immigration, economics, politics, religion, and society.
HIST 151 (GS) (S T S) TECHNOLOGY AND SOCIETY IN AMERICAN HISTORY (3) Development of technology in America from colonial times; its reception and its influence on social, economic, and political life.
HIST 151S (GS) (S T S) TECHNOLOGY AND SOCIETY IN AMERICAN HISTORY (3) Development of technology in America from colonial times; its reception and its influence on social, economic, and political life.
HIST 152 (GH;GI) AFRICAN AMERICAN HISTORY (3) African roots; colonial and revolutionary experiences; slavery and abolitionism; civil war and reconstruction; accommodation and protest; the new militancy.
HIST 153 (GH;GI) THE INDIAN IN NORTH AMERICA (3) A survey of the American Indian from prehistory to the present.
HIST 153W (GH;GI) THE INDIAN IN NORTH AMERICA (3) A survey of the American Indian from prehistory to the present.
HIST 154 (GH;GI) HISTORY OF WELFARE AND POVERTY IN THE UNITED STATES (3) History of care of the impoverished (emphasis on gender, race, nationality, age of poor, and welfare givers), 18th century to present.
HIST 155 (GH) AMERICAN BUSINESS HISTORY (3) Major developments in the history of business and industry from the colonial period to the present.
HIST 156 (L I R) HISTORY OF THE AMERICAN WORKER (3) A study of the American worker from the preindustrial era to the present.
HIST 158 HISTORY OF AMERICAN IMMIGRATION (3) The waves of migration to America and an analysis of the resulting minority groups, their reception, assimilation, and persisting identity.

HIST 160 AMERICAN NAVAL HISTORY (3) Introduction to the role of the United States Navy in the defense, diplomacy, commerce, and scientific development of the nation.
HIST 161 THE BATTLE OF GETTYSBURG IN AMERICAN HISTORICAL MEMORY (3) Examines factors shaping understanding of the Civil War's decisive battle and its meanings as a national symbol.
HIST 165 (ARAB;RL ST) INTRODUCTION TO ISLAMIC CIVILIZATION (3) Islamic history, culture, and religious life c.600-1500 C.E.
HIST 172 (GI) SURVEY OF JAPANESE CIVILIZATION (3) Survey of social, institutional, cultural, and religious developments from ancient times to the present.
HIST 173 (GH) VIETNAM IN WAR AND PEACE (3) Rise of nationalism and communism; origins of conflict; United States involvement; impact on postwar regional and international politics; contemporary Vietnam.
HIST 174 (GH;GI) THE HISTORY OF TRADITIONAL EAST ASIA (3) Comparative cultural, institutional, and social history of traditional China and Japan to their contact with the industrialized West.
HIST 175 (GH;GI) THE HISTORY OF MODERN EAST ASIA (3) Comparative survey of the internal developments and external relations of China and Japan since their contact with the industrialized West.
HIST 176 (GH;GI) SURVEY OF INDIAN HISTORY (3) Survey of cultural, institutional, and political history from ancient times to the present.
HIST 178 (GH;GI) LATIN-AMERICAN HISTORY TO 1820 (3) Conquest of the New World, development of colonial institutions, impact on native cultures, and origins of independence movements.
HIST 179 (GH;GI) LATIN-AMERICAN HISTORY SINCE 1820 (3) Origin, political growth, international relations, and economic status of the Latin-American republics, with emphasis upon present-day conditions.
HIST 181 (GH;GI) INTRODUCTION TO THE MIDDLE EAST (3) Origins of Islamic civilization; expansion of Islam; the Ottoman Empire; the Middle East since 1918.
HIST 187 HISTORY FRESHMAN SEMINAR (3) The meaning and advantages of a Liberal Arts education in context of a specific discipline. Prerequisite: first-semester standing and enrollment in the College of the Liberal Arts
HIST 191 (GH;GI) (AAA S) EARLY AFRICAN HISTORY (3) Explores important economic and cultural transformations in the making of early African empires from 1 MBC to 1750.
HIST 192 (GH;GI) (AAA S) MODERN AFRICAN HISTORY (3) Impact of the slave trade, expansion of Islam, colonial conquest, social and cultural transformations, resistance, nationalism, independence.
HIST 197 SPECIAL TOPICS (1—9)
HIST 199 (GI) FOREIGN STUDIES (1—12)
HIST 200 AMERICAN LOCAL HISTORY (3 per semester, maximum of 6) Topics in American local history relating local to national developments and studying the historical method by using primary source material. Prerequisite: HIST 020 or HIST 021
HIST 210 (GH;GI) (AAA S) BETWEEN ACCOMMODATION AND ALIENATION: AFRICAN AMERICANS IN A JIM CROW NAT ION, 1896-1932 (3) The course will explore the context and events that shaped African American life over the period 1896-1932. Prerequisite: AAA S 100, three credits of American history, or permission of the instructor
HIST 211 (GH;GI) (AAA S) THE EMERGENCE AND EVOLUTION OF THE BLACK DIASPORA IN THE ATLANTIC WORLD (3) The course will explore the history and role of African and African-descent people in Africa, the Americas, and Europe. Prerequisite: AAA S 100 or HIST 003 or HIST 020 or HIST 021 or HIST 152
HIST 230 (NUTR;S T S) AMERICAN FOOD SYSTEM: HISTORY, TECHNOLOGY, AND CULTURE (3) A cultural analysis of the evolution of U.S. agricultural production and food consumption patterns, the food industry and food marketing.
HIST 235 (J ST;RL ST) THE CHURCH AND THE JEWS (3) Examination of the relationship between Western church and the Jews from the First Century to Enlightenment.
HIST 240 (GH;GI) (AAA S) HARLEM: HISTORY, CULTURE, AND POLITICS, 1890-PRESENT (3) This course will explore the history of Harlem as a major Black urban community and a cultural center. Prerequisite: AAA S 100 or HIST 152
HIST 250 (GH;GI) (AAA S) INTRODUCTION TO THE MODERN CARIBBEAN (3) A survey course which explores the historical evolution and emergence of the modern Caribbean.
HIST 294 RESEARCH PROJECT (1–12)
HIST 296 INDEPENDENT STUDIES (1–18)
HIST 297 SPECIAL TOPICS (1–9)
HIST 299 (GI) FOREIGN STUDIES (1–12)
HIST 300A EUROPEAN HISTORIOGRAPHY (3) Readings, group discussions, and oral and written reports on great historians, philosophy of history, and conflicting interpretations in European history. Prerequisite: third-semester standing, 6 credits in history with a grade of A or B, an all-University average of B
HIST 300B AMERICAN HISTORIOGRAPHY (3) Readings, group discussions, and oral and written reports on great historians, philosophy of history, and conflicting interpretations in American history. Prerequisite: third-semester standing, 6 credits in history with a grade of A or B, an all-University average of B
HIST 300C INDEPENDENT STUDY (3) Readings and oral and written reports in areas to be arranged with the chairman of the Honors Committee. Prerequisite: HIST 300A or HIST 300B
HIST 300D HONORS THESIS (3) Research paper in an area arranged with the chairman of the Honors Committee. Prerequisite: HIST 300A, HIST 300B, HIST 300C

HIST 300H HONORS COURSE IN HISTORY (3—12) No description available.
HIST 302W UNDERGRADUATE SEMINAR (3) Thematic or topical investigation; emphasis on historical criticism and analysis. Prerequisite: 6 credits in history at the 400 level
HIST 395 INTERNSHIP (1—18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
HIST 399 (GI) FOREIGN STUDY—HISTORY (1–12) Study in selected foreign countries of various periods and topics in history.
HIST 401 (J ST) ANCIENT TECHNOLOGIES AND SOCIO-CULTURAL HISTORY IN THE ANCIENT LEVANT (3) Social and intellectual development in the Ancient Levant as they affected and were affected by technological development. Prerequisite: RL ST 110
HIST 402 THE RISE OF THE GREEK POLIS (3) Development of the Greek city-state from Homeric times to the fifth century B.C.; special references to Athenian society. Prerequisite: HIST 100
HIST 403 ALEXANDER THE GREAT AND THE HELLENISTIC WORLD (3) The career of Alexander, his impact on his own time, and the Hellenistic legacy. Prerequisite: HIST 100
HIST 404W ROME AND HELLENISM (3) The impact of traditional Greek culture on ancient Italian society in the age (ca. 300-30 B.C.) of Roman imperial expansion. Prerequisite: HIST 100, HIST 101, or CAMS 033
HIST 405W THE ROMAN EMPIRE (3) The political and social history of the Roman empire; economic institutions and religious groups which influenced Roman administration. Prerequisite: HIST 001, HIST 101, or 3 credits in classical studies
HIST 407 EARLY MEDIEVAL SOCIETY (3) Rise of European nations and evolution of their social and political institutions from the time of Constantine to the Crusades. Prerequisite: HIST 107
HIST 408 CHURCH AND STATE IN THE HIGH MIDDLE AGES (3) European political, institutional, and social history in light of church- state tensions from the Crusades to the Renaissance. Prerequisite: HIST 107
HIST 409W (GI) (J ST;RL ST) EUROPEAN ANTI-SEMITISM FROM ANTIQUITY TO THE PRESENT (3) Surveys the history of anti-Semitism in Europe from antiquity through the Middle Ages to the present.
HIST 410 (J ST;RL ST) JEWS IN THE MEDIEVAL WORLD (3) Trends in medieval Jewish society under Islam and Western Christendom.
HIST 411 (MEDVL) MEDIEVAL BRITAIN (3) Political, cultural, and economic history of Britain from circa 400 to 1485 with an emphasis on the kingdom of England. Prerequisite: 6 credits in European history or medieval studies
HIST 412 INTELLECTUAL HISTORY OF THE MIDDLE AGES (3) Intensive study of selected topics, such as philosophy, mysticism, heresy, the church, literary and artistic expression, and science. Prerequisite: HIST 107
HIST 413 (MEDVL) MEDIEVAL CELTIC STUDIES (3) Celtic civilization from antiquity to the end of the middle ages. Prerequisite: 3 credits in medieval studies, or in language, literature, or Europena history of the medieval period
HIST 414 RENAISSANCE AND REFORMATION (3) The transformation of consciousness from medieval to modern times, with special emphasis on Renaissance Italy and Reformation Germany. Prerequisite: HIST 001
HIST 415 (GI) (AAA S) RACE, GENDER, AND POLITICS IN THE UNITED STATES AND SOUTH AFRICA (3) This thematic course will compare key issues, figures, and events in the historical development of the United States and South Africa. Prerequisite: AAA S 100, AAA S 102, AAA S 110, AAA S 192, or HIST 152
HIST 416 (J ST) ZIONIST HISTORY 1890-1948 (3) History of Zionist thought and politics to the foundation of Esrael 1948.
HIST 417 THE AGE OF ABSOLUTISM (3) Seventeenth- and eighteenth-century royal absolutism in France, Prussia, and Austria; concurrent economic, social, and scientific developments; the Enlightenment. Prerequisite: HIST 001
HIST 418 THE FRENCH REVOLUTION AND THE NAPOLEONIC ERA (3) Development of revolutionary France and the First French Empire and their impact on Europe from 1789 to the Vienna settlement. Prerequisite: HIST 002
HIST 419 (WMNST) THE HISTORY OF FEMINIST THOUGHT (3) A critical analysis of European and United States feminist thought from the renaissance to the present. Prerequisite: HIST 116, HIST 117, WMNST 001, OR WMNST 003
HIST 420 RECENT EUROPEAN HISTORY (3) Impact of two World Wars in twentieth century; social conflict and economic catastrophe; political radicalism; post-1945 recovery and cooperation. Prerequisite: 3 credits in European history
HIST 421 (WMNST) THE HISTORY OF EUROPEAN WOMEN (3) European women's lives from the Middle Ages to the present. Prerequisite: HIST 116, HIST 117, WMNST 001, OR WMNST 003
HIST 422 MODERNITY AND ITS CRITICS: EUROPEAN THOUGHT SINCE 1870 (3) Perceptions and critiques of modernity as seen in works of European cultural criticism, social theory, philosophy, and literature. Prerequisite: HIST 002, HIST 120, or 3 credits in modern literature or philosophy or political or social theory
HIST 423 ECONOMIC HISTORY OF EUROPE SINCE 1750 (3) Comparataive history of industrialization process; monetary financial systems; business cycles; public finance; welfare and warfare economics; planning; labor organization. Prerequisite: 3 credits in European history or economics
HIST 424H (J ST;RL ST;PHIL) MONOTHEISM AND THE BIRTH OF THE WEST (3) The birth of monothe-

ism and its relation to social organization, the idea of individuality, and science. Prerequisite: CAMS 004, CAMS 110, CAMS 120, or HIST 102

HIST 425 WORK AND LEISURE IN INDUSTRIAL EUROPE (3) Impact of industrialization on the workday and the changing role of leisure and family life, 1700-1960.

HIST 426 (ADM J;J ST) JEWISH/AMERICAN ORGANIZED CRIME IN NEW YORK CITY (3) History of Jewish/American organized crime in New York City from 1890 through the Great Depression.

HIST 427 GERMANY SINCE 1860 (3) Bismarckian power-state; rise to economic dominance; welfare and warfare under Weimar republic and Hitler; post-1945 reconstruction and democracy. Prerequisite: 3 credits in European history

HIST 428 (S T S) THE DARWINIAN REVOLUTION (3) The origins and implications of evolutionary theory. Prerequisite: an introductory science course and a history course

HIST 430 EASTERN EUROPE IN MODERN TIMES (3) Influence of geography, economic conditions, and nationalism upon the Eastern European and Balkan peoples; Pan-Slavism, conflicting interests of the great powers. Prerequisite: HIST 001 or HIST 002

HIST 431 (GI) (AAA S) BLACK LIBERATION AND AMERICAN FOREIGN POLICY (3) This course deals with American foreign policy and Black liberation in Africa since 1945. Prerequisite: 3 credits in African history; 3 credits in African political science; or 3 credits in American political science

HIST 432 (GI) (AAA S) BETWEEN NATION AND EMPIRE: THE CARIBBEAN IN THE 20TH CENTURY (3) An exploration of the political evolution of the Caribbean Region over the course of the 20th Century. Prerequisite: HIST 250

HIST 433 IMPERIAL RUSSIA, 1700-1917 (3) Enlightened absolutism, mercantilism, westernization; economic progress, liberal reforms, and revolutionary movement; major intellectual and cultural trends; Russia as great power. Prerequisite: HIST 141

HIST 434 HISTORY OF THE SOVIET UNION (3) Revolution; social, political, economic, and cultural continuity and change in the U.S.S.R. since 1917. Prerequisite: HIST 141 or HIST 142

HIST 436 GREAT BRITAIN UNDER THE TUDORS AND STUARTS, 1485-1688 (3) Religious, political, and constitutional developments in the British Isles. Prerequisite: HIST 001 or HIST 002

HIST 437 GREAT BRITAIN 1688-1867 (3) Social, economic, and political history of Great Britain from late Stuart times until the mid-Victorian era. Prerequisite: HIST 001 or HIST 002

HIST 438 GREAT BRITAIN 1867-PRESENT (3) Social, economic, and political history of Great Britain from the mid- Victorian era to the present. Prerequisite: HIST 001 OR HIST 002

HIST 440 COLONIAL AMERICA TO 1753 (3) Background, establishment, and growth of the American colonies, including economic, political, social, religious, and intellectual developments. Prerequisite: HIST 020, 3 additional credits in history

HIST 441 REVOLUTIONARY AMERICA, 1753-1783 (3) Forces in Great Britain and America causing withdrawal of thirteen colonies from the British Empire and the Revolutionary War. Prerequisite: HIST 020, 3 additional credits in history

HIST 442 THE EARLY AMERICAN REPUBLIC, 1783-1850 (3) Confederation and Constitution; the Federalist and Jeffersonian periods; "the Era of Good Feelings"; "the Age of Jackson." Prerequisite: 3 credits in American history

HIST 444 THE UNITED STATES IN CIVIL WAR AND RECONSTRUCTION—1850-1877 (3) Causes of the Civil War; conduct of the war, North and South; impact of the war; problems of Reconstruction. Prerequisite: HIST 130

HIST 445 THE EMERGENCE OF MODERN AMERICA (3) Economic, social, political history of the United States, 1877-1919, emphasizing growth of industrialism and development as a modern nation. Prerequisite: HIST 021, 3 additional credits in history, economics, or political science

HIST 446 AMERICA BETWEEN THE WARS (3) The Roaring Twenties, the Great Crash, Depression, and New Deal; war debts, reparations, isolationism, and World War II.

HIST 447 RECENT AMERICAN HISTORY (3) Contemporary economic, social, and political aspects of the United States and its role as a world power since 1945. Prerequisite: HIST 021, 3 additional credits in history, economics, or political science

HIST 448 AMERICA IN THE 1960S (3) Social, political, and cultural themes in the United States in the 1960s. Prerequisite: HIST 021

HIST 449 CONSTITUTIONAL HISTORY OF THE UNITED STATES TO 1877 (3) Colonial background; framing and adoption of the constitution; development of the court under Marshall and Taney; sectionalism, Civil War, Reconstruction. Prerequisite: HIST 020 or HIST 021, 3 additional credits in history or political science

HIST 450 CONSTITUTIONAL HISTORY OF THE UNITED STATES SINCE 1877 (3) Constitutional developments from laissez-faire to the welfare state; imperialism, war, internationalism; the contemporary court, civil liberties, and civil rights. Prerequisite: HIST 020 or HIST 021, 3 additional credits in history or political science

HIST 451 THE CONSUMER REVOLUTION (3) The origins and impact of American consumer society since 1870. Prerequisite: three credits in history, marketing, or advertising

HIST 452 HISTORY OF U.S. FOREIGN RELATIONS (3) History of U.S. foreign relations since 1789; emphasis on twentieth century. Prerequisite: HIST 020 or HIST 021

HIST 453 (GEOG) AMERICAN ENVIRONMENTAL HISTORY (3) The history of the ways Americans have used and thought about the environment since 1500. Prerequisite: GEOG 030, LARCH 003; and HIST 020, HIST 021; or 6 credits in the humanities or social sciences

HIST 454 AMERICAN MILITARY HISTORY (3) Development of U.S. military policy, 1776 to the present, emphasizing the conduct of our wars, interrelationship of civil and military authority. Prerequisite: HIST 020 or HIST 021

HIST 456W THE SOCIAL HISTORY OF AMERICAN VERNACULAR BUILDING, 1607-1980 (3) Social, historical, and cultural context of American building including settlements, housing, workplaces, stores, recreational facilities; changes over time. Prerequisite: 3 credits in American history

HIST 457 (S T S;WMNST) THE HISTORY OF WOMEN IN SCIENCE (3) Critical analysis of the roles women, gender, and minorities have played in natural sciences. Prerequisite: HIST 116, HIST 117, WMNST 001, WMNST 003, OR WMNST 005

HIST 458W (L I R) HISTORY OF WORK IN AMERICA (3) A study of selected problems in the history of work in the United States, especially since 1877. Prerequisite: HIST 021, HIST 156, or L I R 100

HIST 459W SOCIAL AND CULTURAL HISTORY OF THE UNITED STATES SINCE 1783 (3) Role of immigration, social reform movements, religion, education, science, literature, and the arts in American history.

HIST 460 UNITED STATES FOREIGN INTELLIGENCE (3) Aims, methods, and organization of U.S. foreign intelligence from the American Revolution to the Cold War and beyond.

HIST 461 THE EMERGENCE OF THE AMERICAN CITY: 1100-1880 (3) The growth of American cities from their urban origins in Europe and the Native-American Southwest to 1880.

HIST 462 THE TWENTIETH CENTURY CITY (3) Political, economic, social, and cultural transformations in American cities from 1880 to 2000.

HIST 463 AMERICAN THOUGHT TO 1865 (3) Introduction to, scholarly commentary on, major documents of American Intellectual history, early colonial period to end of the Civil War. Prerequisite: any American history course at the college freshman level

HIST 464 AMERICAN THOUGHT FROM 1865 (3) Introduction to, scholarly commentary on, major documents of American Intellectual history from end of the Civil War to the present. Prerequisite: any American history course at the college freshman level

HIST 465 (GI) (AAA S) CIVIL RIGHTS AND AMERICAN POLITICS 1933-1968 (3) The civil rights struggle and its impact upon American politics. Prerequisite: AAA S 100, HIST 021, HIST 152, PL SC 001, or PL SC 002

HIST 466 (GI) (WMNST) LESBIAN AND GAY HISTORY (3) Critical exploration of the history of sexuality, focusing especially on the emergence of modern lesbian and gay identities. Prerequisite: HIST 117, WMNST 001

HIST 467 LATIN AMERICA AND THE UNITED STATES (3) Historical development of policies of the United States with regard to Latin- American affairs from colonial times to the present.

HIST 468 MEXICO AND THE CARIBBEAN NATIONS IN THE TWENTIETH CENTURY (3) Political, economic, and social development in Mexico and the Caribbean since 1900. Emphasis on Mexican, Guatemalan, and Cuban revolutions.

HIST 469 (ADM J) DRUGS AND DRUG POLICY IN THE UNITED STATES (3) Examines the history and dimensions of drug use and analyzes the impact of drug policy. Prerequisite: 3 credits in: ADM J 012, or ADM J 111, or HIST 021

HIST 471W (RL ST) CLASSICAL ISLAMIC CIVILIZATION, 600-1258 (3) Pre-Islamic Arabia; Muhammad; Arab conquests; Islamic beliefs and institutions; literary, artistic, and scientific achievements; relations with Europe; breakdown of unity.

HIST 472 THE OTTOMAN EMPIRE AND OTHER MUSLIM STATES (3) Turkish and Mongol invasions; Mamluks; Ottoman expansion and institutions; Safavid Persia; disintegration and reform; emergence of modern Turkey and Iran. Prerequisite: HIST 181

HIST 473 THE CONTEMPORARY MIDDLE EAST (3) Political, economic, and social changes in Turkey, Iran, Israel, and the Arab countries in the twentieth century; Arab-Israeli conflict.

HIST 475W THE MAKING AND EMERGENCE OF MODERN INDIA (3) India's transition to social, economic, and political modernity through the experience of British colonial rule and the nationalist struggle. Prerequisite: HIST 010, HIST 011, HIST 172, HIST 175, HIST 176, HIST 181, or HIST 191

HIST 479 HISTORY OF IMPERIALISM AND NATIONALISM IN AFRICA (3) Theories and types of imperialism; varied patterns of colonial administration; initial African responses; nationalism; decolonization and independence. Prerequisite: HIST 191

HIST 480 MEDIEVAL JAPAN (3) An overview of Japan between 1150-1550, a period of political decentralization, cultural efflorescence, and social change. Prerequisite: HIST 107, HIST 172, HIST 174, OR HIST 407

HIST 481 MODERN JAPAN SINCE 1800 (3) The transformation of Japan from a pre-modern, isolated, and agricultural nation into a highly industrialized world power. Prerequisite: HIST 172, HIST 174, or HIST 175

HIST 483 CHINESE SOCIETY AND CULTURE TO 1800 (3) The social, political, and cultural issues and developments from ancient to the late-imperial times. Prerequisite: HIST 174

HIST 484W HISTORY OF CHINESE THOUGHT (3) A study of the dynamic historical development of Chinese thought with its diverse expressions from antiquity to the present. Prerequisite: HIST 174 OR HIST 175

HIST 485W NINETEENTH-CENTURY CHINA (3) Ch'ing society and institutions; "opening" to the west; imperialism; domestic upheaval and its effect upon Chinese society; reform movements. Prerequisite: HIST 175 or HIST 300H (Honors in East Asian history)

HIST 486 TWENTIETH-CENTURY CHINA (3) China from the Republican Revolution of 1911 to the present; nationalism, cultural change; development of communism. Prerequisite: HIST 175 or HIST 300H (Honors in East Asian History)

HIST 490 (L ST) ARCHIVAL MANAGEMENT (1—3) Introduction to the principles and procedures in the management of archives and historical manuscripts.
HIST 493 PRECEPTORSHIP IN TEACHING (3—6 per semester) Supervised experience in research of teaching under the guidance of an approved faclty member. Prerequisite: 3 credits in course-work related to the teaching or research subject
HIST 494 RESEARCH PROJECT (1–12)
HIST 495 INTERNSHIP (1–18)
HIST 496 INDEPENDENT STUDIES (1–18)
HIST 497 SPECIAL TOPICS (1–9)
HIST 499 (GI) FOREIGN STUDY—HISTORY (1–6) Study in selected foreign countries of various periods and topics in history. Prerequisite: 3 credits in the appropriate introductory history course for the geographic location specified

HISTORY (HSTRY)

Penn State Erie, The Behrend College
HSTRY 097, 197, 297, 497 SPECIAL TOPICS (1–9)
HSTRY 100 QUANTITATIVE HISTORICAL RESEARCH TECHNIQUES (3) Introduction to statistical methods and computer techniques in historical research. Prerequisite: CMPSC 101, STAT 200, 3 credits in history
HSTRY 109 (GH;GI) GENDER AND HISTORY (3) Survey of the development of gender roles in Western societies from the prehistoric era to the early modern period.
HSTRY 296, 496 INDEPENDENT STUDIES (1–18)
HSTRY 301W SCOPE AND METHODS OF HISTORY (3) A course designed to introduce students to the analysis, methods, and practices of historical writing and research. Prerequisite: 3 credits in history
HSTRY 401 RESEARCH IN ANCIENT SOURCES (3) Guided research in the literature of ancient Mediterranean civilizations. Prerequisite: HIST 001
HSTRY 406W RESEARCH IN MEDIEVAL SOURCES (3) Guided research in the literature of medieval Europe. Prerequisite: HIST 001
HSTRY 410W THE FRENCH REVOLUTION AND NAPOLEONIC EUROPE (3) Developments in French and European politics, diplomacy, economics, and society from 1789 to 1815. Prerequisite: HIST 002
HSTRY 415 RECENT EUROPE (3) Developments in European politics, diplomacy, economics, and society since 1914. Prerequisite: HIST 002
HSTRY 418 EUROPE IN THE AGE OF NATIONALISM, 1789–1914 (3) Emphasizing the role of nationalism in European cultural, diplomatic and imperial developments; concurrent economic and social changes. Prerequisite: HIST 002
HSTRY 431 EASTERN EUROPE IN MODERN TIMES (3) Developments in Eastern European politics, diplomacy, economics, and society since 1815. Prerequisite: HIST 002
HSTRY 437W GREAT BRITAIN, 1688–PRESENT (3) The Georgian constitution, Victorianism, and political reform; changes in manners and morals; democracy and the evolution of the welfare state. Prerequisite: HIST 001, HIST 002, or HIST 136
HSTRY 461 REVOLUTIONARY AMERICA, 1763–1789 (3) Forces leading to the withdrawal of the thirteen colonies from the British empire, the Revolutionary War, the confederation and constitution. Prerequisite: 3 CREDITS IN HISTORY
HSTRY 462 THE EARLY AMERICAN REPUBLIC, 1789–1850 (3) The Federalist and Jeffersonian periods; the "era of good feelings"; the "age of Jackson". Prerequisite: 3 CREDITS IN HISTORY
HSTRY 463W THE CIVIL WAR AND RECONSTRUCTION, 1850-1877 (3) Causes of the Civil War; conduct of the war, North and South; impact of the war; problems of reconstruction. Prerequisite: 3 credits in history
HSTRY 465 VERSAILLES TO YALTA: AMERICA, 1919–1945 (3) Developments in United States policy, politics, diplomacy, economics, society, and culture from 1919–1945. Prerequisite: HIST 021
HSTRY 466 AMERICA SINCE 1945 (3) Developments in United States policy, politics, diplomacy, economics, society, and culture since 1945. Prerequisite: HIST 021
HSTRY 477 AMERICAN MILITARY HISTORY TO 1900 (3) Development of United States military policy, 1776-1900, emphasizing conduct of wars, interrelationship of civil and military authority. Prerequisite: 3 CREDITS IN HISTORY
HSTRY 478 AMERICAN MILITARY HISTORY SINCE 1900 (3) Development of United States military policy int he Twentieth Century, emphasizing conduct of wars, interrelationship of civil and military authority. Prerequisite: 3 CREDITS IN HISTORY
HSTRY 480 AMERICAN DIPLOMACY, 1776–1914 (3) Developments in the foreign policy of the United States from independence to the eve of World War I. Prerequisite: HIST 002 or HIST 020
HSTRY 481 AMERICAN DIPLOMACY SINCE 1914 (3) Developments in the foreign policy of the United States since the eve of World War I. Prerequisite: HIST 002 or HIST 021
HSTRY 495 INTERNSHIP (1–6) Practical experience in the management and utilization of historical archives.

HONORS (HONOR)

Capital College

HONOR 301H THE ROLE OF KNOWLEDGE IN SOCIETY (3) An interdisciplinary study of a topic utilizing contributions from science/ engineering, business, public policy, behavioral sciences/education, and the humanities. Prerequisite: admission to Penn State Harrisburg honors program

HONOR 401H HONORS SEMINAR (3) An in-depth exploration of a topic or theme that crosses disciplinary boundaries; may be repeated for credit. Prerequisite: admission to Penn State Harrisburg Honors Program

HONOR 493H HONORS SERVICE LEARNING (1–3) A supervised experience of doing service for campus or community welfare and analyzing related issues. Prerequisite: enrollment in the Penn State Harrisburg Honors Program

HONOR 494M INTERDISCIPLINARY WRITING AND THESIS FORMULATION (2) Seminar to help students approach interdisciplinary analysis, writing as interpretive process, and how to formulate a thesis project and proposal. Prerequisite: enrollment in the Penn State Harrisburg Honors Program

HONOR 495H RESEARCH STUDIES (1) A capstone seminar for honors students working on honors theses and projects to work together and learn about their research interests. Prerequisite: HONOR 301H, enrollment in departmental or honor thesis study

HONOR 496H HONORS THESIS (3) An opportunity to pursue an interdisciplinary thesis or research project among schools or division through the Honors program. Prerequisite: HONOR 301H, senior standing, and permission of the program

HORTICULTURE (HORT)

College of Agricultural Sciences

HORT 101 (GN) HORTICULTURAL SCIENCE (3) Introduction to horticulture with emphasis on plant domestication, morphology, classification, world food crops, commodities, gardens, propagation, and agrochemicals.

HORT 120 COMPUTER APPLICATIONS FOR LANDSCAPE CONTRACTING (2) Emphasis is placed on the use of commercial software used for landscape planning and estimating. Limited to Landscape Contracting majors only.

HORT 131 HERBACEOUS PERENNIAL AND ANNUAL IDENTIFICATION (3) Herbaceous and annual plant identification; landscape use of herbaceous perennials and greenhouse and garden annuals. Prerequisite: BIOL 027, BIOL 110, or HORT 101

HORT 137 ORNAMENTAL PLANT MATERIALS (2–3) Identification and description under fall conditions; discussion of cultural and aesthetic aspects of trees of value in ornamental planting.

HORT 138 ORNAMENTAL PLANT MATERIALS (2–3) Identification and description under spring conditions; discussion of cultural and aesthetic aspects of shrubs of value in ornamental plantings.

HORT 201 APPLIED ARBORICULTURE (2) Overview of methods used to diagnose problems and provide for the long term care of large trees. Prerequisite: Students must be physically capable of safely handling a running chainsaw, and pulling their weight up a rope.

HORT 202 PLANT PROPAGATION (3) Principles and practices of asexual and sexual plant propagation.

HORT 202 PLANT PROPAGATION (3) Principles and practices of asexual and sexual plant propagation. Prerequisite: BIOL 027, BIOL 110, or HORT 101

HORT 220 CAD APPLICATIONS IN LANDSCAPE CONTRACTING (3) Application of computer-aided design software including AutoCAD and LANDCADD to landscape contracting. Prerequisite: HORT 120

HORT 232 HORTICULTURAL SYSTEMATICS (3) Fundamentals of horticultural crop plant classification and systematics. Examples chosen from fruits and vegetables, exclusive of subtropical and tropical fruit. Prerequisite: HORT 101

HORT 238 (TURF) TURF AND ORNAMENTAL WEED CONTROL (3) Students will be introduced to the development of integrated weed management strategies utilizing a variety of cultural and chemical methods. Prerequisite: CHEM 012

HORT 250 LANDSCAPE CONTRACTING DESIGN/BUILD PRINCIPLES (3) Introduction to the processes and principles of residential landscape site development, from initial client contact to implementation.

HORT 269 RESIDENTIAL LANDSCAPE PLANNING (3) Principles and techniques in landscape design; preparation of plans of small properties. Prerequisite: Landscape Contracting majors, in the Design/Build Option

HORT 296, 496 INDEPENDENT STUDIES (1–18)

HORT 297, 298; 497, 498 SPECIAL TOPICS (1–9)

HORT 299, 499 (GI) FOREIGN STUDIES (1–12)

HORT 301 (FOR) PRINCIPLES OF ARBORICULTURE (3) Overview of the concepts and methods prescribed for the evaluation and care of large trees in urban settings. Prerequisite: BIOL 110 and SOILS 101

HORT 315 ENVIRONMENTAL EFFECTS ON HORTICULTURAL CROPS (3) Horticultural plants respond to the environmental factors of light, temperature, water, and fertilizer both in controlled and field environments. Prerequisite: HORT 101, HORT 202

HORT 352 FLOWER ARRANGING (2) Floral design beginning with elements and principles of design. Flower arranging techniques as well as different styles of flower arrangements.

HORT 368 LANDSCAPE PLANTING DESIGN (4) Basic planting design employing the use of indigenous and ornamental plants as design elements in the man-made environment. Intended for Landscape Contracting majors only. Prerequisite: HORT 269

HORT 390 JUNIOR SEMINAR (1) Current issues in horticulture and agriculture. Prerequisite: fifth-semester standing

HORT 402W PLANT NUTRITION (3) Mineral nutrition of higher plants, including nutrient acquisition, transport, metabolism, and practical implications. Prerequisite: HORT 315 or BIOL 441, SOILS 101

HORT 407 PLANT BREEDING (3) The scientific principles and techniques of utilizing genetic variability in improving the heredity of plants for specific purposes.

HORT 408 LANDSCAPE PLANT ESTABLISHMENT AND MAINTENANCE (4) The principles and practices involved in the establishment of plants in the landscape, and their subsequent maintenance. Prerequisite: HORT 137 or HORT 138; SOILS 101

HORT 409 LANDSCAPE PLANT ESTABLISHMENT AND MAINTENANCE LABORATORY (1) Students will actively participate in the practices involved in the establishment of plants in the landscape, and their subsequent maintenance. Prerequisite: HORT 408

HORT 410W ISSUES IN LANDSCAPE CONTRACTING (3) This will be a survey of business management, regulatory, and environmental issues facing the landscape contracting profession. Laboratory. Prerequisite: HORT 408

HORT 412W POST-HARVEST PHYSIOLOGY (3) Harvesting, handling, storage, and transportation of horticultural crops; primary emphasis on physiological response to pre- and post-harvest environmental factors. Prerequisite: 6 credits in horticulture or other plant sciences

HORT 420 PLANT GROWTH REGULATORS (3) Plant growth regulators, their chemical and physical properties; general principles, practices, and applications in regulating plant growth and development. Prerequisite: BIOL 110 or HORT 101

HORT 430W LANDSCAPE MAINTENANCE AND MANAGEMENT (3) Principles and practices in the maintenance and management of landscaped areas. Prerequisite: HORT 101; HORT 137 or HORT 138

HORT 431 SMALL FRUIT CULTURE (3) Cultural requirements and production practices of the principal small fruit crops: strawberries, grapes, blueberries, brambles, and cranberries. Prerequisite: HORT 101, HORT 315

HORT 432 DECIDUOUS TREE FRUITS (3) Science, art, and techniques of regulated cropping; orchard designs and management systems. Prerequisite: HORT 101, HORT 315

HORT 433 VEGETABLE CROPS (3) Cultural requirements of important vegetable crops in conjunction with physiological processes and problems related to commercial production. Prerequisite: HORT 101, HORT 315

HORT 440W PLANT WATER RELATIONS (3) Fundamentals of plant water relations including acquisition, transport, conservation, response to drought, measurement of water status, relationship to productivity, interaction with mineral nutrition, and use of equipment. Prerequisite: BIOL 441 or BIOL 446 or permission of department

HORT 444 ADVANCED PLANT BREEDING (4) Exploration of the interrelationships of genetic, cytological, physiological, and environmental factors in plant improvement. An individual research project is required. Prerequisite: HORT 407

HORT 445 PLANT ECOLOGY (3) Advanced lectures on plant ecology which stress integration of physiological, population-level and community-level phenomena, and ecology in agriculture. Prerequisite: BIOL 220W, FOR 308, or HORT 315

HORT 450 GREENHOUSE MANAGEMENT (3) Maintenance and manipulation of the greenhouse production systems including structures, covers, light, temperature, carbon dioxide, water, growing media, fertilizer and greenhouse cost accounting. Prerequisite: HORT 101, HORT 315

HORT 453 FLOWER CROP PRODUCTION AND MANAGEMENT (3) Production of greenhouse flower and foliage plants; development of management skills for a greenhouse business. Prerequisite: HORT 101, HORT 315

HORT 455 RETAIL HORTICULTURE BUSINESS MANAGEMENT (3) The nature, operation, and management of retail horticulture business, emphasizing retail greenhouses, nurseries, and flower shops. Prerequisite: HORT 131, HORT 137, or HORT 138; 3 credits of marketing

HORT 459 (BIOL;BIOTC) PLANT TISSUE CULTURE AND BIOTECHNOLOGY (3) Principles and techniques for the in vitro culture, propagation, and genetic manipulations of plant cells. Prerequisite: BIOL 230W; or B M B 251, B M B 252

HORT 464 LANDSCAPE CONSTRUCTION I (4) Standards, processes, and computations for site grading, drainage, earthwork, vehicular circulation, parking; detailing, and finishing of landscape construction materials. Prerequisite: HORT 269

HORT 466 LANDSCAPE CONSTRUCTION II (5) Project scheduling methods, plant installation techniques, and field layout principles and practices. Implications of site preparation. Prerequisite: HORT 464

HORT 468 LANDSCAPE ESTIMATING AND BIDDING (2) Reading and interpreting contract drawings and specifications, quantity take- offs, cost estimating, and bid document preparation. Prerequisite: HORT 409 or HORT 466

HORT 490 SENIOR SEMINAR (1) Exploration of the interrelationships of horticulture, science, and society; evaluation of attributes and abilities related to various career opportunities. Prerequisite: HORT 390, SEVENTH-SEMESTER STANDING

HORT 495 INTERNSHIP (1–13) Prerequisite: approval of proposed assignment required prior to registration

HOTEL, RESTAURANT, AND INSTITUTIONAL MANAGEMENT (HR&IM) *College of Health and Human Development*

HR&IM 201 INTRODUCTION TO MANAGEMENT IN THE HOSPITALITY INDUSTRY (3) Introduction to the hospitality industry and hospitality management. Concurrent: HRIM 202

HRIM 202 COLLOQUIUM IN HOSPITALITY MANAGEMENT (1 per semester, maximum of 4) Major industry and professional speakers lecture on current issues followed by discussion with students and faculty.

HRIM 204 HOTEL AND RESTAURANT MARKETING AND MERCHANDISING (3) Merchandising and marketing as a system concerned with motivating consumers to purchase hospitality products and services. This course will not meet the prescribed requirements for the HRIM major in any option.

HRIM 250 QUANTITY FOOD PRODUCTION ANALYSIS (4) Physical characteristics of principal food product groups considered. Topics include purchasing problems, preparation techniques, quality, and cost control. This course will not meet the prescribed requirements for the HR&IM major in any option.

HRIM 260W HOSPITALITY SUPERVISION SEMINAR (4) Hospitality management topics are discussed with a major emphasis on operations management. This course will not meet the prescribed requirements for the HR&IM major in any option. Prerequisite: HRIM 204, HRIM 310, HRIM 380. Prerequisite or concurrent: HRIM 250

HRIM 270 HOSPITALITY ADMINISTRATION SEMINAR (4) Components of food service systems are identified and studied as separate problems and as a total system. This course will not meet the prescribed requirements for the HRIM major in any option. Prerequisite: HRIM 250, HRIM 260W; or HRIM 250, MGMT 341

HRIM 271 INTRODUCTION TO COMPUTERS IN THE HOSPITALITY INDUSTRY (3) Introduction to computers including standard computer applications, basic statistical applications, and hospitality industry usage and application. Prerequisite: STAT 200

HRIM 295 ANALYSIS OF FIELD EXPERIENCE I (2) Directed written and oral analysis of the 500-hour hospitality working experience, focusing on the physical and social environment.

HRIM 296 INDEPENDENT STUDIES (1–18)

HRIM 297 SPECIAL TOPICS (1–9)

HRIM 304 INSTITUTIONAL FOOD SERVICE MANAGEMENT (3) Institutional food service management systems in the hospitality field. Prerequisite: HRIM 201

HRIM 305 RESTAURANT MANAGEMENT (3) Restaurant food service management systems in the hospitality field; analysis including cost control and quality control techniques. Prerequisite: or concurrent: HRIM 201

HRIM 310 HOTEL, RESTAURANT, AND INSTITUTIONAL PURCHASING AND COST CONTROL (3) Purchasing and cost control principles for hotel, restaurant, and institutional operations. Prerequisite: HRIM 201, HRIM 202, HRIM 335, HRIM 380, NUTR 119

HRIM 315 HOSPITALITY SERVICES MANAGEMENT (3) Systems analysis, design, and application of service in hospitality management operations. Prerequisite: HRIM 201 or an introductory management course

HRIM 318 CLUB MANAGEMENT AND OPERATIONS (2) Principles and practices of club organizations and management.

HRIM 319 HOSPITALITY FACILITIES MANAGEMENT (3) Fundamental principles of facilities planning, facilities management, and maintenance for all segments of the hospitality industry. Prerequisite: HRIM 201

HRIM 329 INTRODUCTION TO FOOD PRODUCTION AND SERVICE (2) Principles of quality food production and service stressing the integration of sanitation, menu planning, cost control, and service.

HRIM 330 FOOD PRODUCTION AND SERVICE MANAGEMENT (2) Food service management laboratory stressing the integration of purchasing, menu planning, and costing in quantity production of quality food. Prerequisite: HRIM 329; NUTR 119 or NUTR 120

HRIM 335 HOSPITALITY FINANCIAL ACCOUNTING (3) Basic accounting concepts and practices applicable to hospitality organizations. Prerequisite: MATH 021. Prerequisite or concurrent: HRIM 201, HRIM 202

HRIM 336 HOSPITALITY MANAGERIAL ACCOUNTING (3) Collection, processing, and interpretation of accounting data for managerial planning, control, and evaluation in hospitality organizations. Prerequisite: a grade of "C" or better required for: HRIM 335

HRIM 337 FOOD, BEVERAGE, AND LABOR COST CONTROL (3) Techniques for analyzing and controlling food, beverage, and labor costs in hospitality organizations. Prerequisite: ACCTG 200

HRIM 350 HOSPITALITY DECISION MAKING AND INFORMATION SYSTEMS (3) Application of decision theory and models to solve qualitative and quantitative problems using Hospitality Information Systems and Computer Applications. Prerequisite: CMPSC 203, STAT 200. Prerequisite or concurrent: HRIM 201, HRIM 202

HRIM 365 ORGANIZATIONAL BEHAVIOR IN THE HOSPITALITY INDUSTRY (3) Study of individual satisfaction and performance in hospitality organizations. Topics include cultural diversity, motivation, communication, group behavior, and leadership. Prerequisite: HRIM 201 or MGMT 100

HRIM 380 HOTEL MANAGEMENT (3) Introduction to rooms management including front office, housekeeping, security, and engineering. Emphasizes operations, coordination, and communication within and between departments. Prerequisite: HRIM 201

HRIM 385 MANAGEMENT PRINCIPLES IN DIETETIC SERVICES (3) Application and integration of management principles and leadership skills in dietetic services. Prerequisite: HRIM 330 and NUTR 380

HRIM 390W HOSPITALITY MANAGEMENT COMMUNICATION (3) Development of effective writing and interpersonal communications skills in hospitality management. Prerequisite: ENGL 015 or CAS 100. Prerequisite or concurrent: HRIM 201

HRIM 395W PRACTICUM ANALYSIS (3) Written analysis comparing and contrasting conceptual issues in the hospitality industry. Prerequisite: HRIM 201, 1000 hours of adviser-approved professional hospitality experience

HRIM 397 SPECIAL TOPICS (1–9)

HRIM 405 LEGAL ASPECTS OF THE HOSPITALITY INDUSTRY (3) Specialized applications of law to the hospitality industry. Prerequisite: or concurrent: HRIM 201

HRIM 411 BEVERAGE MANAGEMENT AND WINE SELECTION (3) Management issues in beverage service and products. Students taste wines, brews, and distilled spirits. Prerequisite: students must be at least 21 years old

HRIM 412 ADVANCED INSTITUTIONAL FOOD SERVICE MANAGEMENT (4) Advanced principles of food production management and service and their application in institutional food service settings. Prerequisite: HRIM 330

HRIM 415 INTERNATIONAL CUISINE (3) Cooking and eating practices of cultures around the world, including historical, religious, cultural, geographic, and political influences on each cuisine. Prerequisite: HRIM 201, NUTR 100, NUTR 119

HRIM 430 ADVANCED FOOD PRODUCTION AND SERVICE MANAGEMENT (3) Simulation and application of technical, conceptual, interpersonal skills. Emphasis on group dynamics; improvement in managerial skills; management team functions. Prerequisite: HRIM 330

HRIM 435 FINANCIAL MANAGEMENT IN HOSPITALITY OPERATIONS (3) Fiscal techniques in the development, management, and control of hospitality establishments. Prerequisite: ECON 002 or ECON 014; HRIM 336. Prerequisite or concurrent: HRIM 350

HRIM 436 HOSPITALITY OPERATIONAL MANAGEMENT (3) Tactical management processes of hospitality operations, with an emphasis on integrating concepts from previous courses into daily managerial systems. Prerequisite: HRIM 435, HRIM 442

HRIM 437 HOSPITALITY PROJECT EVALUATION AND FUNDING (3) Current techniques for project evaluation in the hospitality industry; trends in hospitality project funding. Prerequisite: HRIM 435

HRIM 438 CASES IN FINANCIAL ANALYSIS (3) Financial analysis and decision making is examined through a series of hospitality-oriented cases. Prerequisite: HRIM 435

HRIM 442 HOSPITALITY MARKETING (3) Marketing management in the hospitality industry, including analyzing the market through market research and developing a marketing plan. Prerequisite: HRIM 350, MKTG 221

HRIM 443 SALES PLANNING AND ADVERTISING FOR HOSPITALITY OPERATIONS (3) Elements of sales management, advertising, promotion, and public relations as applied to hospitality organizations. Prerequisite: HRIM 442 or 3 credits in marketing

HRIM 444 CARIBBEAN HOSPITALITY/TOURISM DEVELOPMENT (3) Evaluation of sustainable hospitality/tourism.

HRIM 455 CONVENTION MANAGEMENT (3) Management principles of hotel convention sales and service. Prerequisite: HRIM 380, HRIM 442

HRIM 456 CASINO OPERATIONS MANAGEMENT (3) Historical and current perspective of the gaming industry. Management principles of casino operations, including coordination with traditional hospitality services.

HRIM 466 HUMAN RESOURCE MANAGEMENT IN THE HOSPITALITY INDUSTRY (3) Recruitment, selection, training, performance appraisal, and compensation of hospitality human resources in today's culturally diverse work force. Prerequisite: HRIM 365

HRIM 467 MANAGEMENT OF HOTEL AND RESTAURANT EMPLOYEE RELATIONS (3) Survey and analysis of managerial strategies for employee relations in hospitality operations. Prerequisite: HRIM 466

HRIM 470 HOSPITALITY MANAGEMENT INFORMATION SYSTEMS (3) Design, implementation, and analyses of information systems for strategic, tactical, and operational functions of hospitality management. Prerequisite: HRIM 350

HRIM 471 EVALUATION OF HOSPITALITY TECHNOLOGY (3) This course provides students with an understanding of the variety of information technologies used in the hospitality industry. Prerequisite: HRIM 350, HRIM 470

HRIM 480 ADVANCED HOTEL MANAGEMENT (3) Advanced hotel operations, internal control systems, and service philosophy. Integrates management, departmental operations, law, technology applications, marketing and managerial accounting. Prerequisite: HRIM 336, HRIM 380

HRIM 489 SEMINAR IN INSTITUTIONAL FOOD SERVICE MANAGEMENT (3) Contemporary issues in institutional food service management. Prerequisite: HRIM 304

HRIM 490 STRATEGIC HOSPITALITY MANAGEMENT (3) Developing strategic plans for hospitality industry, emphasizing strategy formulation, implementation, and evaluation. Prerequisite: HRIM 365, HRIM 435, HRIM 442

HRIM 491 OPERATIONAL ANALYSIS OF INSTITUTIONAL FOOD SERVICE (3) The development and application of quantitative and qualitative techniques for evaluation of institutional food service. Prerequisite: HRIM 330, HRIM 336, HRIM 337, HRIM 350
HRIM 492 ADVANCED PROFESSIONAL SEMINAR IN HOTEL, RESTAURANT AND INSTITUTIONAL MAN AGEMENT (1) Course prepares senior HR&IM students to assume leadership positions in the hospitality industry (Focus on careers, leadership, ethics, lifelong learning). Prerequisite: 1000 hours of work experience in the hotel, restaurant and institutional management industry Concurrent: HRIM 430, HRIM 466, HRIM 490
HR&IM 495 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
HR&IM 496 INDEPENDENT STUDIES (1–18)
HR&IM 497 SPECIAL TOPICS (1–9)

HUMAN DEVELOPMENT AND FAMILY STUDIES (HD FS)

College of Health and Human Development
HD FS 097, 098 SPECIAL TOPICS (1–9)
*HD FS 129 (GS) INTRODUCTION TO HUMAN DEVELOPMENT AND FAMILY STUDIES (3) Introduction to psychosocial and family development at all stages of the individual and family life cycle.
HD FS 197, 198 SPECIAL TOPICS (1–9)
HD FS 216 PERSONAL AND INTERPERSONAL SKILLS (3) Conceptions of lifespan personal and interpersonal skill enhancement.
HD FS 218 FOUNDATIONS OF MARRIAGE (3) Factors influencing the husband/wife relationship across the life course.
HD FS 219 FAMILY FINANCIAL MANAGEMENT (3) How families plan their finances and factors that determine their decisions.
HD FS 229 (GS) INFANT AND CHILD DEVELOPMENT (3) Theory, research, and methods of social/behavioral/biological sciences related to developmental processes and intervention during infancy and childhood.
HD FS 230 OVERVIEW OF CURRICULAR PRACTICES IN EARLY CHILDHOOD CARE AND EDUCATION (3) Curricular practices in programs for infants, toddlers and preschoolers. Focus on developmentally appropriate practice, emergent curriculum and home/child care links. Prerequisite: HD FS 229
HD FS 231 GUIDANCE IN EARLY CHILDHOOD CARE AND EDUCATION (3) Positive guidance methods for infants, toddlers and preschoolers, leading to self-control and social capability. Includes focus on home/childcare links. Prerequisite: HD FS 229
HD FS 232 CREATIVITY AND PLAY IN EARLY CHILDHOOD CARE AND EDUCATION (3) Planning for play, creativity and exploration in programs for infants, toddlers and preschoolers. Includes focus on home/childcare links. Prerequisite: HD FS 229
HD FS 233 EMERGENT LANGUAGE AND LITERACY: DEVELOPMENT AND PRACTICE IN EARLY CHI LDHOOD CARE AND EDUCATION (3) Fostering development of language and literacy in infants, toddlers and preschoolers. Includes children's literature and focus on home/childcare links. Prerequisite: HD FS 229
HD FS 234 MATHEMATICS AND SCIENCE REASONING: DEVELOPMENT AND PRACTICE IN EARLY CHI LDHOOD CARE AND EDUCATION (3) Fostering development of mathematical reasoning and scientific inquiry in infants, toddlers and preschoolers. Includes project approach and focus on home/childcare links. Prerequisite: HD FS 229
HD FS 239 (GS) ADOLESCENT DEVELOPMENT (3) Social, behavioral, and biological development and intervention throughout adolescence.
HD FS 249 (GS) ADULT DEVELOPMENT AND AGING (3) Physiological, psychological, and social development and intervention from young adulthood through old age.
HD FS 250 (GI) (WMNST) SEXUAL IDENTITY OVER THE LIFE SPAN (3) Concepts of affectional and sexual orientation over life span, with emphasis on Lesbian and gay male personal, family, and community adaptation. Prerequisite: 3 credits in HD FS or 3 credits in social or behavioral sciences
HD FS 287W (GS;GI) INTERCULTURAL COMMUNITY-BUILDING (3) An experiential introduction to negotiating differences in small groups, families, institutions, and communities.
HD FS 287X (GS;GI) INTERCULTURAL COMMUNITY-BUILDING (3) An experiential introduction to negotiating differences in small groups, families, institutions, and communities.
HD FS 296 INDEPENDENT STUDIES (1–18)
HD FS 297, 298 SPECIAL TOPICS (1–9)
HD FS 300H HONORS SEMINAR: CONCEPTS AND ISSUES IN HUMAN DEVELOPMENT AND FAMILY STU DIES (3) Introduces core concepts and issues in the study of human development and family studies. Prerequisite: HD FS 129 or permission of human development and family studies honors adviser
HD FS 301 VALUES AND ETHICS IN HEALTH AND HUMAN DEVELOPMENT PROFESSIONS (3) Examines bases for choices among values in personal and professional relations in human development processes and supporting services.
HD FS 302A LEADERSHIP AND TECHNOLOGY SKILLS FOR HUMAN SERVICES PROFESSIONALS A (3) Development of skills essential for contemporary human services professionals, including critical thinking, problem solving, electronic communications, and information handling. Prerequisite: HD FS 129

HD FS 302B LEADERSHIP AND TECHNOLOGY SKILLS FOR HUMAN SERVICES PROFESSIONALS B (3) Application and enhancement of leadership and technology skills in team settings; emphasis on active and collaborative problem-solving. Prerequisite: HD FS 302A

HD FS 310M SEMINAR IN HONORS—RESEARCH METHODS (3) Overview of research and methods issues tailored around development of honors thesis proposals. Prerequisite: permission of Human Development and Family Studies Honors adviser

HD FS 311 HUMAN DEVELOPMENT AND FAMILY STUDIES INTERVENTIONS (3) Survey of individual and family formal and informal intervention efforts; historical and current perspectives and approaches. Prerequisite: HD FS 129

HD FS 312W EMPIRICAL INQUIRY IN HUMAN DEVELOPMENT (3) Introduction to the skills involved in critical thinking in general and the methods of empirical inquiry in particular. Open to HD FS majors only. Prerequisite: a grade of C or better required in EDPSY 101 or STAT 200

HD FS 315 (GI) FAMILY DEVELOPMENT (3) Family functions over the life course; family from a multidisciplinary perspective, emphasizing adaptation and change. Prerequisite: HD FS 129; 3 credits of social, behavioral, or human biological sciences

HD FS 315W (GI) FAMILY DEVELOPMENT (3) Family functions over the life course; family from a multidisciplinary perspective, emphasizing adaptation and change. Prerequisite: HD FS 129;3 credits of social, behavioral, or human biological sciences

HD FS 330 OBSERVATION OR EXPERIENCE WITH CHILDREN, YOUTH, AND FAMILIES (1–6 per semester) Directed observations of, or supervised experience with children, youth, and families in group or home settings. Prerequisite: HD FS 229 or PSY 213

HD FS 395 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor

HD FS 397, 398 SPECIAL TOPICS (1–9)

HD FS 401 PROJECT PLANNING, IMPLEMENTATION, AND EVALUATION IN THE HUMAN SERVICES (3) Exercises and activities related to the design, planning, implementation and management, and evaluation of projects and programs in the human services. Prerequisite: HD FS 302A

HD FS 402 HUMAN SERVICES SEMINAR (4) Presentations and discussion of contemporary human issues by students and visiting professionals. Prerequisite: HD FS 401

HD FS 405 GENDER AND SOCIAL DEVELOPMENT (3) A review of gender-related patterns of social development over the lifespan, as influenced by biological, sociological, and psychological factors. Prerequisite: HD FS 129, HD FS 312W, or 6 credits in social sciences

HD FS 410 COMMUNITIES AND FAMILIES (3) Family and community interaction, emphasizing strategies for intervention to solve family-community problems. Prerequisite: HD FS 312W, 3 credits of social/behavioral sciences

HD FS 411 THE HELPING RELATIONSHIP (3) Theory and research related to interpersonal conditions which facilitate personal growth; intensive interpersonal competency training. Prerequisite: HD FS 311, HD FS 312W, or 6 credits in Human Development and Family Studies or psychology

HD FS 412 ADULT-CHILD RELATIONSHIPS (3) Theories, research, and application of adult behavior for maximizing adult- child relationships and optimizing child socialization and self-development. Prerequisite: HD FS 229 or PSY 213; HD FS 311, HD FS 315, or HD FS 315W; HD FS 312W

HD FS 413 DEVELOPMENTAL PROBLEMS IN ADULTHOOD (3) Analysis of individual developmental problems from young adulthood through old age and their prevention and modification. Prerequisite: HD FS 129, HD FS 249, HD FS 312W

HD FS 414 RESOLVING HUMAN DEVELOPMENT AND FAMILY PROBLEMS (3) Strategies for, and roles of professional specialists in, the solution of problems in human development and family functioning. Prerequisite: HD FS 312W, 6 credits in Human Development and Family Studies or psychology

HD FS 415 PROGRAM DEVELOPMENT IN FAMILY RELATIONSHIPS (3) Methods for planning, developing, and evaluating human service programs for families across the life span. Prerequisite: HD FS 311, HD FS 312W; HD FS 315 or HD FS 315W

HD FS 417 BIOCULTURAL STUDIES OF FAMILY ORGANIZATION (3) Study of variability in family organization with an emphasis on cultural and economic factors influencing household organization and family roles. Prerequisite: HD FS 129, HD FS 312W, HD FS 315 or HD FS 315W; or 6 credits in sociology or anthropology

HD FS 418 FAMILY RELATIONSHIPS (3) Dynamics of family interaction; effects of parenthood, sibling and intergeneration relationships on family solidarity. Prerequisite: HD FS 312W; HD FS 315 or HD FS 315W

HD FS 420 LABORATORY IN INDIVIDUAL AND FAMILY ENHANCEMENT (3) Supervised practice in methods of assessment, intervention, and evaluation to enhance individual and family development. Prerequisite: HD FS 312W, HD FS 411; 6 additional credits in Human Development and Family Studies

HD FS 424 FAMILY DEVELOPMENT IN AN ECONOMIC CONTEXT (3) Economic conditions influencing family functioning; familial effects on the economy; strategies to enhance work-family relations. Prerequisite: HD FS 312W; HD FS 315 or HD FS 315W

HD FS 425 WORK AS A CONTEXT FOR HUMAN DEVELOPMENT (3) Theory and research on role of work in adult development; interrealtionships between work and family; workplace interventions to enhance development. Prerequisite: HD FS 312W, 3 credits in social and behavioral sciences

HD FS 428 INFANT DEVELOPMENT (3) Conceptual analysis, assessment, and empirical investigation of normal and deviant development, prenatal through first two years of life. Prerequisite: HD FS 229 OR PSY 213; HD FS 312W

HD FS 429 ADVANCED CHILD DEVELOPMENT (3) Processes of development during childhood from birth to adolescence. Emphasis upon theory, method, and empirical research. Prerequisite: HD FS 229 OR PSY 213; HD FS 312W

HD FS 430 EXPERIENCE IN PRESCHOOL GROUPS (6) Guided practicum experience in planning and facilitating developmentally appropriate activities for young children. Prerequisite: HD FS 229 OR PSY 213; HD FS 312W, HD FS 330

HD FS 431 (SOC) FAMILY DISORGANIZATION: STRESS POINTS IN THE CONTEMPORARY FAMILY (3) Focuses on divorce, remarriage, incest, family violence as well as problems associated with family formation and parent-child relations. Prerequisite: HD FS 312W, 6 credits of Human Development and Family Studies, psychology, sociology

HD FS 432 DEVELOPMENTAL PROBLEMS IN CHILDHOOD AND ADOLESCENCE (3) Analysis of problems in individual development from infancy through adolescence; prevention and modification of developmental difficulties. Prerequisite: HD FS 229, HD FS 239, OR PSY 213; HD FS 312W

HD FS 433 DEVELOPMENTAL TRANSITION TO ADULTHOOD (3) Conceptual analysis and empirical investigation of interrelationships between developmental processes during the period of pubertal growth. Prerequisite: HD FS 239, HD FS 312W

HD FS 434 (SOC) SOCIAL GERONTOLOGY (3) An analysis of the demographic, social, and cultural factors affecting the aged population in American society. Prerequisite: HD FS 312W, 6 credits in sociology

HD FS 445 (PSY) DEVELOPMENT THROUGHOUT ADULTHOOD (3) Processes of development and change of behavior from early adulthood through old age, emphasizing theory, method, and empirical research. Prerequisite: HD FS 249, HD FS 312W; statistics; 6 credits in Human Development and Family Studies, psychology, or sociology.

HD FS 446 PROGRAMS AND SERVICES IN GERONTOLOGY (3) Theoretical and historical views of the conceptualization and delivery of programs and services to older persons within a multidisciplinary developmental framework. Prerequisite: HD FS 249 OR HD FS 445; HD FS 312W

HD FS 447 ISSUES IN GERONTOLOGY (3) Analysis of major issues in adulthood and aging, with an emphasis on integration of theory and research. Prerequisite: HD FS 249 OR HD FS 445; HD FS 312W

HD FS 450 DEVELOPMENTAL CHILD PROGRAMS AND SERVICES (3) Current and historical views of the conceptualization and delivery of child programs and services within a multidisciplinary developmental framework. Prerequisite: HD FS 229 OR PSY 213; HD FS 312W

HD FS 453 FAMILY PARTICIPATION AND INVOLVEMENT IN CHILD SERVICES (3) Current and historical perspectives of roles and functions of family members in designing, delivering, and evaluating of child service programs. Prerequisite: HD FS 229, HD FS 312W; HD FS 315 or HD FS 315W

HD FS 454 (E C E) DEVELOPMENT AND ADMINISTRATION OF CHILD SERVICE PROGRAMS (3) Planning, administering, and evaluating child service programs at several administrative levels using methods from relevant disciplines. Prerequisite: HD FS 312W, HD FS 453; C I 295 OR HD FS 330

HD FS 455 DEVELOPMENT AND ADMINISTRATION OF HUMAN SERVICES PROGRAMS (3) Fundamentals of program development and administration of human service programs in community settings; emphasis given to program content, strategies, and the overall planning process. Prerequisite: HD FS 302A

HD FS 468 BIOLOGICAL BASES OF BEHAVIORAL DEVELOPMENT (3) Biological, genetic, and experiential influences in development through the lifespan. Prerequisite: HD FS 129 or PSY 002; HD FS 312W, 3 credits in human biology

HD FS 469H (GI) FAMILY CHANGE IN THE GLOBAL ECONOMY (3) Exploration of how family life, quality, structures in each region of the world are affected by the new global economy. Prerequisite: HD FS 315 or SOC 030

HD FS 477 ANALYSIS OF FAMILY PROBLEMS (3) Analysis of families' behavioral, managerial, interpersonal, and financial problems and their interrelationships. Prerequisite: HD FS 312W; HD FS 315 or HD FS 315W, and 3 credits in social sciences

HD FS 490 INTRODUCTION TO INTERNSHIP EXPERIENCE (2) Planning and preparation for field experience in human service setting. Analysis of human service system and arrangement of site. Prerequisite: HD FS 312W, approval by internship coordinator. Prerequisite or concurrent: HD FS 411

HD FS 494 RESEARCH PROJECT (1–12)

HD FS 494H SENIOR HONORS THESIS (1–6) Independent study under the direction of the thesis advisor of topics related to the interests of the student, culminating in presentation of a thesis. Prerequisite: approval of honors thesis advisor

HD FS 495A INTERNSHIP: ADVANCED EXPERIENCE (8) Full-time, one semester experiential training in human service settings. Open to HD FS majors only. Prerequisite: HD FS 490, permission of internship coordinator

HD FS 495B INTERNSHIP: ADVANCED PROJECT (4) Implementation of internship projects or scholarly paper. Open to HD FS majors only. Prerequisite: or concurrent: HD FS 495A Concurrent: HD FS 495A

HD FS 495C PROFESSIONAL PRACTICUM IN HUMAN SERVICES (3— 8) Guided professional practicum in human services, usually in the form of a project related to a human services issue. Prerequisite: HD FS 401 or HD FS 490

HD FS 496 INDEPENDENT STUDIES (1–18)
HD FS 497, 498 SPECIAL TOPICS (1–9)
*Student may take only one course for General Education credits from HD FS 129 GS or SOC 030 GS.

HUMANITIES (HUM)

Capital College
HUM 420 DILEMMAS OF WAR AND PEACE (3) A multidisciplinary examination of the dilemmas, paradoxes, problems and questions of war and peace, historically and in the contemporary world.

HUMANITIES AND SOCIAL SCIENCES (H&SS)

Penn State Erie, The Behrend College
H&SS 097, 197, 297, 397, 497 SPECIAL TOPICS (1–9)
H&SS 296, 496 INDEPENDENT STUDIES (1–18)

INDUSTRIAL ENGINEERING (I E)

College of Engineering
I E 097 SPECIAL TOPICS (1–9)
I E 100S DISCOVER INDUSTRIAL ENGINEERING: FIRST-YEAR SEMINAR (1) Informational first-year on Industrial Engineering as a career choice and profession; lab exercises; guest speakers; real world problems.
I E 101S BUILD YOUR OWN ROBOT—FIRST-YEAR SEMINAR (1) The objective of this first-year seminar course is to provide students hands-on experience with robotics and automation devices.
I E 102S HUMAN-CENTERED ENGINEERING—FIRST-YEAR SEMINAR (1) This first-year seminar considers what makes products and processes usable by people, through both design principles and student projects.
I E 103S MANAGEMENT SCIENCE AND THE MODERN ENGINEER—FIRST-YEAR SEMINAR (1) This first-year seminar will introduce students to quantitative methods for decision making through a number of hands-on learning exercises.
I E 104S MANAGING THE REAL (UNPREDICTABLE) WORLD—FIRST-YEAR SEMINAR (1) Informational first-year seminar on decision making under uncertainty in engineering and everyday life.
I E 105S MANUFACTURING SCIENCE AND TECHNOLOGY—FIRST-YEAR SEMINAR (1) This first-year seminar will explore some aspects of manufacturing science and technology associated with the manufacturing of electronic products.
I E 297 SPECIAL TOPICS (1–9)
I E 300 INTRODUCTION TO INDUSTRIAL ENGINEERING (1) Introduction to the industrial engineering profession by solving typical problems using various computational hardware and software. Prerequisite: CMPSC 201C or CMPSC 201F
I E 302 ENGINEERING ECONOMY (3) Principles and methods for analyzing the economic feasibility of technical alternatives leading to a decision or recommendation. Prerequisite: MATH 141
I E 310 PRINCIPLES OF DEFORMATION PROCESSING (3) Discussion, laboratory practices, and laboratory experiments covering principles of metal removal and forming, nonmetallic processing, and metrology. Prerequisite: E MCH 011, E MCH 210, or E MCH 110H. Prerequisite or concurrent: E MCH 013, E SC 414M, or MATSE 259
I E 311 PRINCIPLES OF SOLIDIFICATION PROCESSING (3) Discussion, laboratory practices, and laboratory experiments covering principles of metal casting and joining, nondestructive testing, and nonmetallic processing. Prerequisite: E MCH 013, E MCH 110H, or E MCH 210; E SC 414M or MATSE 259
I E 312 PRODUCT DESIGN AND MANUFACTURING PROCESSES (3) Theory and principles of manufacturing; effect on design selection and product quality; processes include material removal, casting, joining, plastic molding. Industrial engineering majors may not schedule this course. Prerequisite: E MCH 013, E MCH 110H, or E MCH 210; E SC 414M or MATSE 259
I E 322 QUANTITATIVE METHODS IN INDUSTRIAL ENGINEERING I (3) The study and application of probability theory in the solution of engineering problems. Prerequisite: MATH 231
I E 323 QUANTITATIVE METHODS IN INDUSTRIAL ENGINEERING II (3) The study and application of statistics in the solution of engineering problems. Prerequisite: I E 322
I E 327 METHODS, WORK MEASUREMENT, AND EMPLOYEE MOTIVATION (3) Methods improvement; work measurement; principles and practices of operation analysis; predetermined motion time systems; wage incentive systems applied to manufacturing. Prerequisite: or concurrent: I E 302
I E 328 PRODUCTION ENGINEERING (3) Theory and principles for economic design of tooling for production, including process planning and numerical control of machine tools. Prerequisite: I E 310
I E 397 SPECIAL TOPICS (1–9)
I E 399 FOREIGN STUDIES—INDUSTRIAL ENGINEERING (1–12) Courses offered in foreign countries by individual or group instruction.
I E 400 ENGINEERING FOR PRODUCTION (3) The selection of the most effective materials and processes and the application of decision theory to product design. Prerequisite: I E 328, ENGL 202C
I E 402 ADVANCED ENGINEERING ECONOMY (3) Concepts and techniques of analyses useful in evaluating engineering projects under deterministic and uncertain conditions. Prerequisite: I E 302, I E 322, I E 405

I E 404 MANAGEMENT SCIENCE (3) The science and art of administration in the management, organization, and coordination of human activity in industrial enterprises. Prerequisite: I E 327

I E 405 LINEAR PROGRAMMING (3) An introduction to the theory and application of the simplex method in solving the linear programming and dual problem. Prerequisite: MATH 220

I E 408W HUMAN FACTORS ENGINEERING (3) Measurement, evaluation, implementation, communication, equipment and data for developing and implementing human/machine/environment systems in industrial and consumer contexts. Prerequisite: I E 323, I E 327

I E 414 MATERIALS JOINING PROCESSES AND PRINCIPLES (3) Characteristics of principal processes for arc, resistance, and solid-state welding; brazing, soldering, adhesive bonding. Laboratory projects using various processes. Prerequisite: I E 311, I E 312, OR METAL 408W

I E 418 HUMAN/COMPUTER INTERFACE DESIGN (3) Design and evaluation of the human/computer interface, including human performance, visual displays, software design, and automated system monitoring. Prerequisite: CMPSC 201C, prerequisite or concurrent I E 408

I E 419 SAFETY SYSTEMS ENGINEERING (3) Systems engineering approach to safety; techniques and procedures used in safety analysis; applications to industrial settings. Prerequisite: I E 323

I E 423 QUALITY CONTROL AND RELIABILITY (3) Application of statistical methods to the control of quality, sampling inspection, and reliability engineering. Prerequisite: I E 323

I E 424 PROCESS QUALITY ENGINEERING (3) Statistical methods for engineering process characterization and improvement. For non-Industrial Engineering majors. Prerequisite: MATH 141, MATH 220

I E 425 INTRODUCTION TO OPERATIONS RESEARCH (3) An introduction to the method and techniques of mathematical decision making, including inventory, replacement, allocation, and waiting line problems. Prerequisite: I E 322, MATH 220

I E 426 INDUSTRIAL AUTOMATION (3) Fundamentals, control, and theory for application of pneumatic, hydraulic, electrical, fluidic, transfer, feeding, and numerical control devices to automated equipment. Prerequisite: I E 328

I E 428 METAL CASTING (3) Application of engineering principles to the design of castings; casting of ferrous and nonferrous alloys; laboratory and simulation projects. Prerequisite: I E 311, I E 312, OR METAL 408W

I E 430 INDUSTRIAL PROJECT (3) A project is carried out in conjunction with an industrial company and supplemented by tutorials. Prerequisite: I E 302, I E 327, I E 328

I E 435 OPERATIONS RESEARCH MODELS (3) An introduction to basic deterministic and probabilistic models, linear programming, dynamic programming, simulation, Markov chains, queueing. Prerequisite: 3 credits of elementary probability theory

I E 438 METAL CUTTING PRINCIPLES AND PRACTICE (3) Principles of metal cutting and introduction to current theories; analysis of metal removal processes; laboratory experiments for metal cutting analysis. Prerequisite: I E 310, I E 312, OR METAL 408W

I E 450 MANUFACTURING SYSTEMS ENGINEERING (3) Components of automated manufacturing systems (CNC, robots, programmable logic controllers). Design, analysis and operational issues related to improved productivity in modern manufacturing systems. Prerequisite: CMPSC 201C and I E 328

I E 451 NUMERICAL CONTROL (3) Introduction to numerical control machines, design considerations, components, manual and computer-aided part programming for multiaxis NC machines. Prerequisite: CMPSC 201C or CMPSC 201F; I E 328

I E 452 MICROCOMPUTERS—PROGRAMMING AND INDUSTRIAL APPLICATIONS (3) Microcomputer principles, capabilities, and limitations; programming and software techniques for real-time industrial engineering application, with integrated laboratory. Prerequisite: CMPSC 201C or CMPSC 201F; I E 426

I E 453 SIMULATION MODELING OF INDUSTRIAL SYSTEMS (3) Introduction of concepts of simulation modeling and analysis, with application to manufacturing and production systems. Prerequisite: CMPSC 201C or CMPSC 201F; I E 323, I E 425

I E 454 APPLIED DECISION ANALYSIS (3) Theory and practice of decision analysis applied to engineering problems. Prerequisite: I E 322

I E 455 PRODUCTION PLANNING AND CONTROL (3) Production palnning/control methods from aggregate to detailed levels; includes underlying theories and principles and industrial applications. Prerequisite: I E 322. Prerequisite or concurrent: I E 405

I E 456 (M E) INDUSTRIAL ROBOT APPLICATIONS (3) Introduction to robotics, with emphasis on robot selection, programming, and economic justification for manufacturing applications. Prerequisite: MATH 220; MATH 250 or MATH 251; I E 328 or M E 051

I E 462 INTRODUCTION TO EXPERT SYSTEMS (3) Building expert systems in general; emphasis on knowledge representation and inference mechanisms in the manufacturing domain. Prerequisite: CMPSC 201C or CMPSC 201F; I E 323

I E 463 COMPUTER AIDED DESIGN AND MANUFACTURING (3) Three dimensional modeling and manufacture of parts and assemblies using Computer Aided Design and manufacturing software, and numerically controlled machines. Prerequisite: I E 312 or I E 328

I E 464 ASSEMBLY OF PRINTED CIRCUIT BOARDS (3) Manufacturing processes and principles for assembly of printed circuit boards with surface mount and through-hole technology. Prerequisite: CHEM 012, PHYS 212

I E 466 CONCURRENT ENGINEERING (3) Concurrent engineering methods for product/process development, capturing customer requirements, insuring manufacturability and serviceability. Prerequisite: MATH 141, MATH 220

I E 467 FACILITY LAYOUT AND MATERIAL HANDLING (3) Analytical, simulation and computer-aided graphical methods to generate effective layout designs; design and integration of material handling systems and equipment. For Industrial Engineering majors. Prerequisite: I E 302, I E 327. Prerequisite or concurrent: I E 453
I E 468 OPTIMIZATION MODELING AND METHODS (3) Mathematical modeling of linear, integer, and nonlinear programming problems and computational methods for solving these classes of problems. Prerequisite: I E 405, MATH 231
I E 494H SENIOR HONORS THESIS (1–9) Students must have approval of a thesis adviser before scheduling this course.
I E 496 INDEPENDENT STUDIES (1–18)
I E 497 SPECIAL TOPICS (1–9)
I E 499 FOREIGN STUDIES—INDUSTRIAL ENGINEERING (1–12).

INDUSTRIAL ENGINEERING TECHNOLOGY (I E T)

Capital College
I E T 308 STATISTICAL QUALITY CONTROL (3) Fundamentals of probability and statistics, introduction to quality control fundamentals, control charts, acceptance sampling.
I E T 311 ELEMENTS OF METALLURGY (3) Introduction to metallurgical concepts, metallurgical testing, phase diagram studies, heat treating concepts, ferrous and nonferrous systems. Prerequisite: CHEM 012, CHEM 014
I E T 321 MANUFACTURING PROCESSES (3) Manufacturing processes for producing metal, plastic, and ceramic items. Primary emphasis is placed on machine tool processes.
I E T 397 SPECIAL TOPICS (1–9)
I E T 402 PRODUCTION MANAGEMENT 3) Principles and practices of managing the manufacturing operations of companies. Topics include management structure, physical plant, quality control, work sampling. Prerequisite: I E T 321
I E T 405 QUALITY CONTROL AND RELIABILITY ENGINEERING (3) Application of statistical methods to the control of quality, sampling inspection, and reliability engineering. Prerequisite: E T 313
I E T 431 AN INTRODUCTION TO PLASTICS AND CERAMICS (3) An introductory study of the properties and processing parameters utilized for plastic and ceramic materials. Prerequisite: I E T 311
I E T 497 SPECIAL TOPICS (1–9)

INDUSTRIAL ENGINEERING TECHNOLOGY (IE T)

College of Engineering
IE T 101 MANUFACTURING MATERIALS, PROCESSES, AND LABORATORY (3) Mechanical properties of materials; primary processing methods used in manufacturing; ferrous and nonferrous metals; important plastic plus ceramic materials; dimensional verification and measurements; mechanical properties evaluation; laboratory methods; statistical interpretation of data.
IE T 105 ECONOMICS OF INDUSTRY (2) Internal economics of industrial enterprise, cost factors, and methods of comparing alternate proposals.
IE T 109 INSPECTION AND QUALITY CONTROL (3) Inspection methods and procedures and their application to control and acceptance sampling based on statistical methods. Prerequisite: MATH 082
IE T 215 PRODUCTION DESIGN (2) Design of tools required for production. Study of advanced technologies in manufacturing systems, including CNC, automation and robotics, CAD-CAM, and CIM. Prerequisite: IE T 101 Concurrent: IE T 216
IE T 216 PRODUCTION DESIGN LABORATORY (2) Laboratory methods in production design and manufacturing processes of systems including computer applications, automation and robotics, non-destructive testing, material removal and joining. Prerequisite: IE T 101 Concurrent: IE T 215; EG T 201 or EMET 311
IE T 296 INDEPENDENT STUDIES (1–18)
IE T 297 SPECIAL TOPICS (1–9)

INDUSTRIAL ENGINEERING TECHNOLOGY (IETBD)

Penn State Erie, The Behrend College
IETBD 296, 496 INDEPENDENT STUDIES (1–18)
IETBD 297, 497 SPECIAL TOPICS (1–9)
IETBD 333 ENGINEERING ECONOMICS FOR TECHNOLOGISTS (2) Fundamentals of engineering economics; equivalence and rate of return analysis; replacement models; depreciation and tax considerations; and economic decision making for technologists. Prerequisite: MTHBD 210 or MATH 141

INDUSTRIAL HEALTH AND SAFETY (I H S)

College of Earth and Mineral Sciences
I H S 400 PRINCIPLES OF INDUSTRIAL HEALTH AND SAFETY (3) Overview of the system health and safety concept and workplace concerns; comprehensive loss prevention and control Prerequisite: CHEM 012, E MCH 210, MATH 141

I H S 410 SAFETY BEHAVIOR AND THE INVESTIGATION PROCESS (3) This course investigates the relationship between human behavior and safety; includes an overview of human behavior issues in the context of accident/incident investigation techniques. Prerequisite: PSY 002
I H S 420 FIRE PROTECTION (3) Overview of the behavior of fire, fire hazards, suppression systems, alarms and detection systems, and fire codes. Prerequisite: CHEM 012, CHEM 014; MATH 141; PHYS 211, PHYS 212
I H S 425 INDUSTRIAL ELECTRICAL SAFETY (3) Description and analysis of electrical hazards in industrial environments, hazard reduction practices, technologies, and programs. A laboratory is included. Prerequisite: PHYS 211, PHYS 212
I H S 430 INDUSTRIAL HEALTH AND SAFETY PROGRAM MANAGEMENT (3) This course examines the essence of safety management in terms of its responsibilities, objectives, and organization. Prerequisite: MGMT 100
I H S 435 INTRODUCTION TO MILL AND PLANT OPERATIONS (1) An introduction to methods used in the mineral and related process industries; relevant unit operations; selection of equipment. Not intended for students majoring in Mining Engineering, Mineral Processing, or Geo-Environmental Engineering. Prerequisite: MATH 141
I H S 440 INDUSTRIAL VENTILATION (3) Ventilation for removal and control of industrial contaminants; measurement, isolation, dilution, and exhaust strategies; laboratory work included. Prerequisite: MATH 141, PHYS 212
I H S 445 INDUSTRIAL HYGIENE AND TOXICOLOGY (3) Recognition, evaluation, and control of physical, chemical, and biological hazards to promote safety and health using regulatory requirements and professional judgement. Prerequisite: CHEM 012, PHYS 211, PHYS 212
I H S 447 INDUSTRIAL HYGIENE MEASUREMENTS (4) Introduction to industrial hygiene measurement techniques for evaluating occupational exposure to chemical, physical, and biological hazards; laboratory work included. Prerequisite: I H S 445
I H S 450 ENVIRONMENTAL HEALTH AND SAFETY (3) Overview of environmental laws and regulations, worker right-to-know laws, and technical issues of environmental health and safety. Prerequisite: CHEM 012, CHEM 014, MATH 141, PHYS 211, PHYS 212
I H S 470 ANALYTICAL METHODS FOR SYSTEM SAFETY (3) Quantitative and qualitative methods of system safety of analysis are covered; issues in risk assessment, acceptance, analysis, and communication, as well as accident cost analysis and cost-benefit analysis are included. Prerequisite: MS&IS 200 or STAT 200
I H S 490 INDUSTRIAL HEALTH AND SAFETY SEMINAR (1) Seminar dealing with contemporary issues of industrial health and safety. Prerequisite: SENIOR STANDING
I H S 495W INDUSTRIAL HEALTH AND SAFETY INTERNSHIP (6) The preparation of a technical report on hazard assessment and control, resulting from experiential education gained at industrial worksites. Prerequisite: ENGL 202C, senior standing
I H S 497 SPECIAL TOPICS (1–9 per semester)

INFORMATION SCIENCES AND TECHNOLOGY (IST)

School of Information Sciences and Technology
IST 097 SPECIAL TOPICS (1–9)
IST 098 SPECIAL TOPICS (1–9)
IST 110 INTRODUCTION TO INFORMATION SCIENCES AND TECHNOLOGY (4) Introduction to information systems including social implications, and the creation, organization, analysis, storage, retrieval, and communication of information.
IST 110L INTRODUCTION TO INFORMATION SCIENCES AND TECHNOLOGY (4) Introduction to information systems including social implications, and the creation, organization, analysis, storage, retrieval, and communication of information.
IST 110P INTRODUCTION TO INFORMATION SCIENCES AND TECHNOLOGY Introduction to information systems including social implications, and the creation, organization, analysis, storage, retrieval, and communication of information.
IST 111S SEMINAR IN INFORMATION SCIENCES AND TECHNOLOGY (1) Introduction to academic requirements, career planning, and information literacy for students majoring in the School of Information Sciences and Technology.
IST 197 SPECIAL TOPICS (1–9)
IST 198 SPECIAL TOPICS (1–9)
IST 210 ORGANIZATION OF DATA (3) Introduction to concept of databases including the storage, manipulation, evaluation, and display of data and related issues. Prerequisite: IST 110
IST 211 ADVANCED TOPICS IN RELATIONAL DATABASE MANAGEMENT SYSTEMS (3) In depth coverage of: database administration, advanced SQL inquires, normalization, referential integrity; troubleshooting, tweaking; implementation dependent transactions, embedded SQL, ODBC. Prerequisite: IST 210
IST 212 OBJECT-ORIENTED DATABASE SYSTEMS (3) Introduction to object-oriented database systems. Prerequisite: IST 210
IST 213 ADVANCED TOPICS IN DATA MANAGEMENT (3) Introduction to emerging technologies and special applications of database management systems. Prerequisite: IST 211

IST 214 DATABASE MANAGEMENT PROJECT (3) Project course in database management systems. Prerequisite: IST 210, IST 211

IST 220 NETWORKING AND TELECOMMUNICATIONS (3) Introduction to digital network topologies; transmission media; signal modulation; digital packet switching and routing; systems integration; communications management; security. Prerequisite: IST 110

IST 221 INTRODUCTION TO TELECOMMUNICATIONS SYSTEMS (3) Telephony, digital telecommunications, private telecommunication systems, transmission media, signaling, switching and networking, and amplitude modulation. Prerequisite: IST 220

IST 222 VOICE AND DATA COMMUNICATIONS (3) Noise in communications systems, types of modulation, transmission codes, terminals, interfaces, the telephone. Prerequisite: IST 221

IST 223 PROTOCOLS AND NETWORKS (3) The telephone network, modems, protocols, network configurations, internet and emerging technologies, error correction, fiber optics. Prerequisite: IST 220

IST 224 WIRELESS SYSTEMS (3) Wave propagation, transmission lines, antennas and waveguides, microwave radio communications, satellite communications, and cellular telephones. Prerequisite: IST 223

IST 225 PC HARDWARE BASICS (3) Preparation for PC hardware support; students learn data recovery and how to build, configure, upgrade, troubleshoot, diagnose, and repair PC's. Prerequisite: IST 220

IST 226 NETWORKING ESSENTIALS (3) Concepts for peer-to-peer and server-based network; ISO-OSI reference model, industry standards, troubleshooting, performance monitoring, optimization. Prerequisite: IST 220

IST 227 NETWORK ADMINISTRATION (3) Administering peer-to-peer and client/server networks; planning, installation, server configuration, resource management, remote access, performance monitoring, and optimization. Prerequisite: IST 226

IST 228 ADVANCED NETWORK ADMINISTRATION (3) TCP/IP planning, installation, configuration; IP addressing, subnetting, routing, DHCP, WINS, address/name resolution, DNS; database, web, mail server management. Prerequisite: IST 226

IST 230 LANGUAGE, LOGIC, AND DISCRETE MATHEMATICS (3) Introduction to formal languages, mathematical logic, and discrete mathematics, with applications to information sciences and technology. Prerequisite: MATH 110 or MATH 140

IST 240 INTRODUCTION TO COMPUTER LANGUAGES (3) Introduction to the specification and application of languages and language paradigms which interact with computers. Prerequisite: CMPSC 101 Concurrent: IST 230

IST 247 CONTEMPORARY PROJECTS IN SOFTWARE DEVELOPMENT (3) The analysis, design, coding, testing, and documentation of a software project using state-of-the art languages/tools and concepts. Prerequisite: CMPBD 205; IST 211 or IST 256

IST 250 NEW MEDIA AND THE WEB (3) Introduction to how the world wide web utilizes emerging technologies. Students acquire conceptual understanding of constructing web sites. Prerequisite: IST 110 or concurrent enrollment

IST 255 FUNDAMENTALS OF WEB ADMINISTRATION (3) An introduction to fundamental web administration concepts: Internet, Graphic Design, HTML, Security, Legal/Ethical Implications, Internet Business. Prerequisite: IST 250

IST 256 PROGRAMMING FOR THE WEB (3) An introduction to fundamental web programming concepts: Advanced HTML, DHTML, XML, Data Warehouses, JavaScript, CGI, and Java. Prerequisite: IST 250

IST 257 ADVANCED WEB ADMINISTRATION (3) This course covers web site server installation, access, management, security, performance monitoring and optimization, network services, and troubleshooting. Prerequisite: IST 255

IST 258 WEB ADMINISTRATION STUDIO (3) Web Administration Option capstone course; students will plan and build a fully-functioning web site that meets client needs. Prerequisite: IST 255, IST 256

IST 260W INTRODUCTION TO SYSTEMS ANALYSIS AND DESIGN (3) Introduction to systems analysis and design stressing the process of requirements acquisition, specification, design, and implementation. Prerequisite: IST 110

IST 271 INTEGRATED BUSINESS AND MANUFACTURING PROCESSES (3) Integrated business and manufacturing processes: history, principles, supply chain management, enterprise system, resources, automation, process economics, data organization and metrics development. Prerequisite: IST 210, IST 295A Concurrent: IST 273

IST 272 ELECTRONIC ESSENTIALS (3) Introduction to electronics, digital logic, data acquisition, and computer automation. Prerequisite: IST 271, MATH 110 Concurrent: CMPBD 204 or CMPSC 101

IST 273 MECHANICAL ESSENTIALS (3) Introduction to statics, strength of material, and metallurgy. Prerequisite: MATH 110 Concurrent: IST 271

IST 274 TOOLS OF MANUFACTURING PROCESSES (3) Examination of industry tools, their application, study of applications, and tool usage that represents the total business and manufacturing process. Prerequisite: IST 271, IST 273 Concurrent: IST 272

IST 295A DISTRIBUTED TEAM PROJECT (1–3) Supervised experience where teams of students work on information system design projects gathered from industry or units within the university. Prerequisite: IST 110

IST 295B IST INTERNSHIP (1–3) Supervised work experience where the student is employed in an information science and technology position in industry, government, or academia. Prerequisite: IST 110

IST 296 INDEPENDENT STUDIES (1–18)

IST 297, 498 SPECIAL TOPICS (1–9)

IST 301 INFORMATION AND ORGANIZATIONS (3) Overview of organizational structures and functions. Includes information processing and analytic perspectives of organizations. Prerequisite: IST 210, IST 220
IST 302 IT PROJECT MANAGEMENT (3) Explore and apply the basic concepts, methodologies, and tools of project management in the field of information science and technology. Prerequisite: IST 210, IST 220
IST 311 OBJECT-ORIENTED DESIGN AND SOFTWARE APPLICATIONS (3) Introduction to object-oriented applications including applications in an OOD language(s). Prerequisite: CMPBD 204 or CMPSC 101; IST 240
IST 321 INFORMATION TECHNOLOGY AND SYSTEMS INTEGRATION I (3) Introductory course on integration of information technology into different systems including the planning, development, and implementation of the integration. Prerequisite: IST 240
IST 321L INFORMATION TECHNOLOGY AND SYSTEMS INTEGRATION I (3) Introductory course on integration of information technology into different systems including the planning, development, and implementation of the integration. Prerequisite: IST 240
IST 321P INFORMATION TECHNOLOGY AND SYSTEMS INTEGRATION I Introductory course on integration of information technology into different systems including the planning, development, and implementation of the integration. Prerequisite: IST 240
IST 331 ORGANIZATION AND DESIGN OF INFORMATION SYSTEMS: USER AND SYSTEM PRINCIPLES (3) Interdisciplinary survey of topics related to the use and usability of information systems. Prerequisite: IST 230
IST 397 SPECIAL TOPICS (1–9)
IST 398 SPECIAL TOPICS (1–9)
IST 402 EMERGING TECHNOLOGIES (3 per semester, maximum of 9) Introduction to technology forecasting and analysis; overview of leading technologies in IST and how they impact information systems and users. Prerequisite: IST 210 IST 220
IST 411 DISTRIBUTED-OBJECT COMPUTING (3) Introduction to distributed-object computing and its use in client/server and real-world computing applications. Prerequisite: IST 311
IST 412 THE ENGINEERING OF COMPLEX SOFTWARE SYSTEMS (3) Introduction to the engineering of complex software systems including software system specification, design and implementation, integration and test, and evolution. Prerequisite: IST 311
IST 413 USER INTERFACE DESIGN AND DEVELOPMENT (3) Project-based course emphasizing user interface development topics such as information processing issues, development and testing techniques, and application requirements. Prerequisite: IST 331
IST 420 FUNDAMENTALS OF SYSTEMS AND ENTERPRISE INTEGRATION (3) Introductory course on integration of information technology into different venues including the planning, development, and implementation of the integration. Prerequisite: IST 240, IST 301, IST 302
IST 421 ADVANCED ENTERPRISE INTEGRATION: TECHNOLOGIES AND APPLICATIONS (3) Advanced course on the integration of information technology into systems applications. Prerequisite: IST 420
IST 431 THE INFORMATION ENVIRONMENT (3) Survey of social environment of information technology: themes of community, sovereignty, privacy, ethics, economics, and knowledge management. Prerequisite: IST 210, IST 220
IST 432 LEGAL AND REGULATORY ENVIRONMENT OF INFORMATION SCIENCE AND TECHNOLOGY (3) Legal environment of information technology, constitutional/political issues, intellectual property, management, e-commerce, privacy, access, computer contracting, cyberspace regulation. Prerequisite: IST 240
IST 440W INFORMATION SCIENCES AND TECHNOLOGY INTEGRATION AND PROBLEM SOLVING (3) Problem-based approach to technology integration by focussing on a real life problem faced by an organization. Prerequisite: ENGL 202C or ENGL 202D, seventh-semester standing (this course is intended for seniors), and the five common course requirements plus at least three of the required courses in an option
IST 441 INFORMATION RETRIEVAL AND ORGANIZATION (3) This is an introductory course for seniors and graduate students covering the practices, issues, and theoretical foundations of organizing and analyzing information and information content for the purpose of providing access to textual and non-textual information resources. This course will introduce students to the principles of information storage and retrieval systems and databases. Prerequisite: IST 210, IST 240
IST 495 INTERNSHIP (1–18)
IST 496 INDEPENDENT STUDIES (1–18)
IST 497 SPECIAL TOPICS (1–9)
IST 498 SPECIAL TOPICS (1–9)

INFORMATION SYSTEMS (INFSY)

Capital College

INFSY305 MICROCOMPUTERS IN BUSINESS (3) Introduces microcomputer applications in business. Provides hands-on experience in using major applications software relevant to various concepts and functions.
INFSY 307 ALGORITHMIC CONCEPTS (3) Using state-of-art programming language; concepts, program structure and design, documentation, file handling, and elementary data structures are introduced.

INFSY 390 INFORMATION SYSTEMS MANAGEMENT AND APPLICATIONS (3) Specification, design and implementation of information systems directed at aiding decision making in organizations. Prerequisite: CMPSC 203, M I S 204
INFSY 391 PRINCIPLES OF E-COMMERCE (3) Introduction to the fundamental Principles of Electronic Commerce (E-Commerce) technologies, applications, and management of E-Commerce in modern organizations. Prerequisite: INFSY 390
INFSY 397 SPECIAL TOPICS (1– 9)
INFSY 413 INTERFACE DESIGN FOR INFORMATION SYSTEMS APPLICATIONS (3) The study of interface design emphasizing application and user requirements, development and testing techniques, and information processing issues. Prerequisite: INFSY 307
INFSY 430 PROGRAMMING FOR BUSINESS APPLICATIONS (3) Introduction to the syntax and grammar of COBOL language with emphasis on applications to business data processing. Prerequisite: M I S 204
INFSY 431 WEB TECHNOLOGIES (3) Fundamentals of Web development for e-business and related project management. Prerequisite: INFSY 307, INFSY 390, or permission of the department
INFSY 435 FILE MANAGEMENT IN COBOL (3) Creation and maintenance of sequential and direct access files, report writing, and other advanced programming techniques. Prerequisite: INFSY 430
INFSY 436 BUSINESS PROGRAMMING FOR THE WEB (3) Advanced programming for WEB-based applications. Prerequisite: INFSY 307
INFSY 440 OBJECT ORIENTED DESIGN IN BUSINESS (3) Object oriented programming concepts and analysis and design methodologies with an emphasis on business applications. Prerequisite: INFSY 307
INFSY 445 DATABASE MANAGEMENT (3) Designed to provide students with explanation, comparison of techniques, methodology of systems, limitations, application of various data base management systems. Prerequisite: INFSY 307 OR INFSY 430
INFSY 446 GLOBAL INFORMATION SYSTEMS (3) Provide student with broad understanding of global information systems utilization and management in modern organizations. Prerequisite: INFSY 390
INFSY 447 EXPERT SYSTEMS IN BUSINESS (3) Introduction to expert systems concepts, methodologies, and managerial implications. Prerequisite: INFSY 307 or INFSY 430
INFSY 448 BUSINESS TELECOMMUNICATIONS (3) Introduces telecommunication concepts, its evolution, and present applications in business. Discusses the software and hardware components of telecommunication networks. Prerequisite: INFSY 390
INFSY 450 SYSTEM DESIGN PROJECT (3) A project in the design, specification, and programming of a system in an application area. Prerequisite: permission of Program Coordinator
INFSY 489 SEMINAR IN INFORMATION SYSTEMS (3) Covers new trends and concepts in information/processing technology and their applications and impact on computer information systems. Prerequisite: INFSY 307
INFSY 494 RESEARCH PROJECT (1–12)
INFSY 495 INTERNSHIP (1–18) r
INFSY 496 INDEPENDENT STUDIES (1–18)
INFSY 497 SPECIAL TOPICS (1–9)

INSTRUCTIONAL SYSTEMS (INSYS)

College of Education

INSYS 200 TECHNOLOGY AS A THINKING TOOL (3) Use of technologies for knowledge representation, critical thinking, planning, and learning.
INSYS 297, 298 SPECIAL TOPICS (1– 9)
INSYS 400 INTRODUCTION TO INSTRUCTIONAL TECHNOLOGY FOR EDUCATORS (1– 3) Use of microcomputers, video, and other media in education; models use technologies including video, audio, print, computer, and telephone. Prerequisite: EDPSY 014
INSYS 411 ORIENTATION TO INSTRUCTIONAL SYSTEMS (2– 3) An orientation to selection, utilization, and curricular integration of instructional media. Prerequisite: EDPSY 014
INSYS 412 DEVELOPING EFFECTIVE TRAINING PRESENTATIONS (3) The design, development, and presentation of effective training presentations for business and industry. Prerequisite: SENIOR STANDING
INSYS 413 DESIGNING INSTRUCTIONAL MANUALS AND TEXT (3) Designing textual materials for information retrieval, performance, and learning using job aids, manuals, programmed instruction, information mapping, etc.
INSYS 415 SYSTEMATIC INSTRUCTIONAL DEVELOPMENT (3) Preparation in the use of a nine-step model for systematically analyzing instructional problems and developing validated, practical solutions.
INSYS 425 CORPORATE INSTRUCTIONAL SYSTEMS (3) Provides an overview of the applications and applicability of Instructional Systems Design in business/corporate environment. Prerequisite: INSYS 415
INSYS 440 AN INTRODUCTION TO COMPUTERS FOR EDUCATORS (3) Computer literacy; introduction to educational uses of computers. Prerequisite: 6 credits in education
INSYS 441 DESIGN, DEVELOPMENT, AND EVALUATION OF INTERNET RESOURCES (3) Design, production, and evaluation of instructional materials for delivery on the Internet.
INSYS 442 INNOVATIVE INSTRUCTIONAL APPLICATIONS OF MICROCOMPUTER TECHNOLOGY (3) Educators experience and develop innovative instructional applications of text-processing, database management, spreadsheet, and telecommunication software in their classrooms. Prerequisite: INSYS 440

INSYS 443 EDUCATIONAL APPLICATIONS OF LOGO (3) Prepares educators to use and to teach the Logo programming language on microcomputers. Students write programs and develop course materials. Prerequisite: INSYS 440
INSYS 446 COMPUTERS AS LEARNING TOOLS (3) Using software to support learning, including databases, spreadsheets, semantic networks, expert systems, hypermedia construction, modeling tools, and computer conferencing.
INSYS 447 INSTRUCTIONAL DESIGN FOR MULTIMEDIA TECHNOLOGIES (3) State of the art multimedia technology hardware such as interactive video, CD-ROM and digitizing audio and video.
INSYS 448 USING THE INTERNET IN THE CLASSROOM (3) This course introduces students to methods and models of using the Internet effectively in their classroom. Prerequisite: demonstrated Internet awareness
INSYS 449 VIDEO AND HYPERMEDIA IN THE CLASSROOM (3) Skills and knowledge needed to direct the use of learning technologies in educational settings. Prerequisite: INSYS 415
INSYS 461 DESIGNING COMPUTER NETWORKS FOR EDUCATION (3) Applying fundamental concepts of computer networking to design effective networks for educational purposes. Prerequisite: INSYS 448
INSYS 462 COORDINATING TECHNOLOGY USE IN EDUCATION (3) Skills and knowledge needed to direct the use of learning technologies in educational settings. Prerequisite: INSYS 448
INSYS 471 INTRODUCTION TO EDUCATIONAL SYSTEM DESIGN (3) Investigates systems theory and how components of educational systems interact; develops insights on current issues and models in Educational System Design.
INSYS 472 COMMUNICATION AND EDUCATIONAL SYSTEMS DESIGN (3) Develops communication and technology-based presentation skills in educational systems designers. Prerequisite: INSYS 471
INSYS 496 INDEPENDENT STUDIES (1–18)
INSYS 497, 498 SPECIAL TOPICS (1–9)

INSURANCE (INS)

Smeal College of Business

INS 102 PERSONAL INSURANCE PLANNING (3) Introduction to the principles and practices of personal insurance planning. May not be used to satisfy Smeal College baccalaureate degree requirements. Prerequisite: third-semester standing
INS 296 INDEPENDENT STUDIES (1–18)
INS 297 SPECIAL TOPICS (1– 9)
INS 301 RISK AND INSURANCE (3) Introduction to the principles and methods of handling business and personal risks; emphasis on insurance techniques. Prerequisite: fourth-semester standing
INS 305 PROPERTY AND CASUALTY INSURANCE (3) Insurance coverages available for protection of property; fire and allied lines, consequential losses, casualty coverages, fidelity and surety bonds. Prerequisite: INS 301
INS 310W PROPERTY AND LIABILITY INSURANCE MARKET (3) Property and liability insurance industry and company operations. Prerequisite: INS 301
INS 320 LIFE INSURANCE (3) Protection and savings features of the life insurance contract as they affect the individual; business uses of life insurance. Prerequisite: INS 301
INS 395 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
INS 400 ESTATE PLANNING (3) Creation, conservation, and distribution of property rights, emphasizing investments, insurance, wills, trusts, and taxation. Prerequisite: B A 301 OR INS 301
INS 401 FUNDAMENTALS OF PRIVATE PENSIONS (3) Analysis of pension regulation, funding, vesting, retirement annuities under insured and self-insured plans, actuarial cost analysis, plan termination insurance. Prerequisite: ACCTG 211, B A 301, ECON 002, MS&IS 200
INS 405 CORPORATE RISK MANAGEMENT (3) Insurance management for corporate organizations; self-insurance, risk transfer, and other alternatives to insurance. Prerequisite: B A 301 OR INS 301
INS 410 COMPOUND INTEREST AND ANNUITIES—CERTAIN (3) Compound interest and annuity functions; equations of value; determination of yield rates; construction of tables. Prerequisite: MATH 141
INS 411 LIFE CONTINGENCIES I (3) A study of the mathematical theory of life contingencies; single-life functions and their applications. Prerequisite: INS 410, STAT 414
INS 412 LIFE CONTINGENCIES II (3) Joint-life and survivor-life functions, population life tables, and multiple decrement theory, with applications to disability and retirement problems. Prerequisite: INS 411
INS 496 INDEPENDENT STUDIES (1–18)
INS 497 SPECIAL TOPICS (1–9)

INTEGRATIVE ARTS (INART)

College of Arts and Architecture

INART001 (GA) THE ARTS (3) Develop critical perception, knowledge, and judgments through an examination of the basic concepts common among the arts.
INART 003 (GA) RECEPTION OF THE ARTS (3) This course considers how art uses time, space, and causality to define culture and the human condition.

INART 005 (GA) PERFORMING ARTS (3) Introduction to music, dance, and theatre. Orientation to the aesthetics, theory, and practice of professional performance.
INART 010 (GA) THE POPULAR ARTS IN AMERICA: MASS MEDIA ARTS (3) An introduction to mass media with emphasis on how theatre, radio, television, and print media influence and reflect society.
INART 015 (GA) THE POPULAR ARTS IN AMERICA: PERFORMING ARTS (3) The development of the performing arts of American popular culture; emphasis on popular music, dance, theatre, and variety arts.
INART 050 (GN) THE SCIENCE OF MUSIC (3) Waves, physics of sound, hearing, musical scales, musical instruments, and room acoustics.
INART 055 (GA) HISTORY OF ELECTROACOUSTIC MUSIC (3) A history of electroacoustic music as a consequence of developments in culture and technology from 1880 to present.
INART 062 (GA;GI) WEST AFRICAN AND AFRICAN AMERICAN ARTS: FROM THE 1960S TO THE PRESENT (3) An introduction to West African and African American Arts from the 1960s to the present.
INART 090 (GA) (ART) INTRODUCTION TO PHOTOGRAPHY (3) An introduction to the aesthetics, history, and science of photography including practical and critical approaches to the art of photography.
INART 100 (GA) SEMINAR IN INTEGRATIVE ARTS (3) A study of various arts with emphasis on comparison, contrast, and other aspects of interrelation. Topics will change each semester.
INART 100W (GA) SEMINAR IN INTEGRATIVE ARTS (3) A study of various arts with emphasis on comparison, contrast, and other aspects of interrelation. Topics will change each semester.
INART 110 (GA) THE DRAMATIC ARTS IN THE MASS MEDIA (3) The place of television-radio-film drama in our culture; relationship with other art forms; standards of evaluation.
INART 115 (GA) THE POPULAR ARTS IN AMERICA: POPULAR MUSIC (3) An examination of the roots, development, and significance of popular music in our culture.
INART 210 (GA) INTEGRATIVE APPROACHES TO COMPUTER-AIDED MUSIC COMPOSITION (3) Interdisciplinary introduction to music composition using software to assist with notation; historical perspectives drawn from art, dance, theater, and literature. Prerequisite: MUSIC 008 or instructor permission
INART 214 INTRODUCTION TO WEB CONTENT AND DESIGN (3) Introduction to Web site creation using project activities to explore writing and editing, navigation issues, usability, and overall Web site architecture.
INART 258 (GA) FUNDAMENTALS OF MIDI AND DIGITAL AUDIO (3 credits per semester) Music Technology (Introduction to how musical information is stored and processed in computer systems.) Prerequisite: MUSIC 008 and INART 055 or concurrent enrollment in either MUSIC 131 or MUSIC 132
INART 294, 494 RESEARCH PROJECTS (1–12) Supervised student activities on research projects identified on an individual or small-group basis.
INART 295, 495 INTERNSHIP (1–18)
INART 296, 496 INDEPENDENT STUDIES (1–18)
INART 297. 497; 298, 498 SPECIAL TOPICS (1–9)
INART 299, 499 (GI) FOREIGN STUDIES (1–12)
INART 401 APPLICATIONS IN DIGITAL IMAGING (4 credits per semester) An advanced digital photography course that explores new methods in the creation and presentation of images using the latest technologies. Prerequisite: ART 392
INART 402 NEW MATERIALS AND METHODS IN APPLIED DIGITAL IMAGING (4 per semester) Advanced course where student teams use digital photography, video, and scanning to present story ideas using World Wide Web and gallery exhibition. Prerequisite: ART 392

INTERDISCIPLINARY HUMANITIES (I HUM)

Capital College

I HUM 300W INTERPRETATIONS IN THE HUMANITIES (3) A study of selected themes, topics, or periods that introduces students to interdisciplinary approaches to knowledge, interpretation, and creative expression. Prerequisite: ENGL 015, ENGL 202, and at least 30 credits
I HUM 302 TECHNOLOGY AND THE HUMANITIES (3) An interdisciplinary study of the effects on the individual of scientific and technological change.
I HUM 311 THE WESTERN TRADITION I (3) From prehistory through the Roman world. Prerequisite: fifth-semester standing
I HUM 312 THE WESTERN TRADITION II (3) The Middle Ages and the Renaissance. Prerequisite: fifth-semester standing
I HUM 313 THE WESTERN TRADITION III (3) The making of the modern mind. Prerequisite: fifth-semester standing
I HUM 400 EXPRESSIONS IN THE HUMANITIES (3) Capstone course for School of Humanities majors: students synthesize and apply approaches to a topic in creative expression and knowledge. Prerequisite: I HUM 300W, seventh-semester standing
I HUM 410 (GI) RELIGION AND CULTURE (3) A comparative examination of several world religions in their social and cultural contexts. Prerequisite: sixth-semester standing
I HUM 430 PHILOSOPHY AND LITERATURE (3) The study of philosophical viewpoints in literature. Prerequisite: fifth-semester standing
I HUM 453 TEXTS AND CULTURE (3) Study of art, literature, film, and other creative genres to illustrate the interrelationships between creative expression and cultural practices. Prerequisite: fifth-semester standing

I HUM 460 THEMATIC STUDIES (3 per semester) Analysis of a group of related ideas in art, music, literature, and/or philosophy. (May be repeated for credit.) Prerequisite: fifth-semester standing
I HUM 461 SELECTED PERIODS IN THE HUMANITIES (3 per semester) Interdisciplinary studies dealing with selected periods of world culture. (May be repeated for credit.) Prerequisite: fifth-semester standing
I HUM 491 SEMINAR IN INTERDISCIPLINARY HUMANITIES (3 credits per semester) Interdisciplinary studies dealing with selected periods of world culture. (May be repeated for credit.) Prerequisite: I HUM 300W, seventh-semester standing
I HUM 494 RESEARCH PROJECT (1–12)
I HUM 495 INTERNSHIP (1–6) Supervised internship for undergraduate or graduate Humanities majors in state offices, educational institutions, arts agencies, community organizations, or humanities councils. Prerequisite: senior-level status for undergraduate students; 18 credits of course work for graduate students; approval of program required
I HUM 496 INDEPENDENT STUDIES (1–18)
I HUM 497 SPECIAL TOPICS (1–9)
I HUM 499 (GI) FOREIGN STUDIES (1–12)

INTERNATIONAL AGRICULTURE (INTAG)

College of Agricultural Sciences
INTAG 100 (GS;GI) INTRODUCTION TO INTERNATIONAL AGRICULTURE (3) Survey of agriculture and food production in developing countries; socioeconomic and technical considerations. (Note: Write for a further listing of courses in and related to International Agriculture.)
INTAG 296, 496 INDEPENDENT STUDIES (1–18)
INTAG 297, 298; 397, 398; 497, 498 SPECIAL TOPICS (1–9)
INTAG 481 PROBLEMS IN AGRICULTURE IN TROPICAL AREAS (3) Students apply their "expertise" to problems in agriculture. An integral component is a trip to tropical areas at their expense. Prerequisite: completion of six credits in applicant's major and successful completion of interview
INTAG 495 INTERNSHIP IN INTERNATIONAL AGRICULTURE (1–13 per semester) Observation of and participation in the operation and management of a University-approved international agricultural firm or international agricultural development agency. Prerequisite: prior approval of proposed internship plan

INTERNATIONAL BUSINESS (I B)

Smeal College of Business
I B 296 INDEPENDENT STUDIES (1–18)
I B 297 SPECIAL TOPICS (1–9)
I B 303 (GI) INTERNATIONAL BUSINESS OPERATIONS (3) A survey of the major aspects of international business environment and operations with an emphasis on the cultural dimension. Prerequisite: fifth-semester standing
I B 395A PRACTICUM IN INTERNATIONAL BUSINESS (3–5) Professional and guided international business work experience taken as part of an approved education abroad program. Prerequisite: B A 301, B A 302, B A 303, B A 304
I B 403 INTERNATIONAL BUSINESS AND NATIONAL POLICIES (3) Evaluation of national economic policies in the light of international economic theory; their impacts on operations of the international business firm. Prerequisite: ACCTG 211, B A 301
I B 404 CONTEMPORARY ISSUES IN INTERNATIONAL BUSINESS (3) Investigation of issues in international business practice interpreted from the foundations of the social sciences. Topics will be chosen from contemporary issues in global business and economics. Prerequisite: ACCTG 211, B A 301
I B 407 (FIN) MULTINATIONAL FINANCIAL MANAGEMENT (3) Analysis of the international aspects of managerial finance; emphasis on the impact of the international financial environment on firm operations. Prerequisite: FIN 305W
I B 421 (ACCTG) INTERNATIONAL ACCOUNTING (3) Unique financial and managerial accounting problems facing multinational corporations; accounting systems in different economic environments. Prerequisite: ACCTG 471
I B 445 (GI) (MKTG) GLOBAL MARKETING (3) Role of international marketing in the global environment; political, economic, geographic, historical, cultural conditions; developing and implementing international marketing strategies. Prerequisite: B A 303 or MKTG 221
I B 496 INDEPENDENT STUDIES (1–18)
I B 497 SPECIAL TOPICS (1–9)

INTERNATIONAL BUSINESS (INT B)

Penn State Erie, The Behrend College
INT B 197, 297, 397, 497 SPECIAL TOPICS (1–9)
INT B 411 INTERNATIONAL BUSINESS (3) Analysis of business firms in international environments; effect of international economic, political, and sociocultural factors on multinational business operations. Prerequisite: FNC 300, MANGT 300, MANGT 310, MRKTG 300

INTERNATIONAL STUDIES (INLST)

College of the Liberal Arts

INLST 493 INTERNATIONAL STUDIES (3) Selected topics in International Studies. Prerequisites: prior participation in an education abroad program or international work experience, and enrollment in the International Studies major

INLST 495 INTERNSHIP (1–12) Internship in International Studies. Prerequisite: enrollment in the International Studies major or minor and approval by the International Studies adviser

INTERNATIONAL STUDIES (INTST)

Penn State Erie, The Behrend College

INTST 100 (GS;GI) INTRODUCTION TO INTERNATIONAL STUDIES (3) An introductory multidisciplinary course designed to familiarize students with critical international issues.

INTST 100S (GS;GI) INTRODUCTION TO INTERNATIONAL STUDIES (3) An introductory multidisciplinary course designed to familiarize students with critical international issues.

INTST 400W (GI) SEMINAR IN INTERNATIONAL STUDIES (3) An upper-division seminar focusing on one or two critical international issues from an interdisciplinary perspective; individual projects. Prerequisite: ENGL 202A, ENGL 202B, ENGL 202C, or ENGL 202D; INTST 100

INTST 494 RESEARCH PROJECT (1–12)

INTST 495 INTERNSHIP (1–18)

INTST 496 INDEPENDENT STUDIES (1–18)

INTST 497 SPECIAL TOPICS (1–9)

INTERNATIONAL UNDERSTANDING (INT U)

College of the Liberal Arts

INT U 187 INTERNATIONAL UNDERSTANDING FRESHMAN SEMINAR (3) The meaning and advantages of a Liberal Arts education in context of a specific discipline. Prerequisite: first-semester standing and enrollment in the College of the Liberal Arts

INT U 200 (GS) INTERNATIONAL UNDERSTANDING AND WORLD AFFAIRS (3) Interdisciplinary consideration of international problems, conflict and accommodation; impact of various cultures and ideologies on world affairs and foreign policy. Credit will not be given for both this course and PL SC 014. Prerequisite: third-semester standing

ITALIAN (IT)

College of the Liberal Arts

IT 001 ELEMENTARY ITALIAN I (4) For beginners. Grammar, with reading and writing of simple Italian; oral and aural work stressed.

IT 002 ELEMENTARY ITALIAN II (4) Grammar and reading continued; oral and aural phrases progressively increased; composition. Prerequisite: IT 001

IT 003 INTERMEDIATE ITALIAN (4) Advanced grammar; oral and written composition; reading of modern authors; Italian life and culture. Prerequisite: IT 002

IT 083S (GH;GI) FIRST-YEAR SEMINAR IN ITALIAN LITERATURE, FILM, AND CULTURE (3) Introduction to the study of Italian literature, film, and culture.

IT 099 (GI) FOREIGN STUDIES (1–12)

IT 130 (GH;GI) ITALIAN CULTURE AND CIVILIZATION (3) Italian life from antiquity to the present; literature, film, the arts, and contemporary problems in historical perspective.

IT 131 (GH;GI) ITALIAN AMERICAN CULTURE AND CIVILIZATION (3) Italian-American experience from the late 19th century to present. Socio-political issues seen through cinema and through literary and other readings.

IT 187 ITALIAN FRESHMAN SEMINAR (3) The meaning and advantages of a Liberal Arts education in context of a specific discipline. Prerequisite: first-semester standing and enrollment in the College of the Liberal Arts

IT 197 SPECIAL TOPICS (1–9)

IT 199 (GI) FOREIGN STUDIES (1–12)

IT 230 (GH) MASTERPIECES OF ITALIAN LITERATURE IN ENGLISH TRANSLATION (3) Emphasis on works and authors of international importance. Lectures, readings, and written work in English.

IT 294 RESEARCH PROJECT (1–12)

IT 296 INDEPENDENT STUDIES (1–18)

IT 297 SPECIAL TOPICS (1–9)

IT 299 (GI) FOREIGN STUDIES (1–12)

IT 301 ADVANCED GRAMMAR AND LANGUAGE DEVELOPMENT (3) For majors, minors, and others with adequate preparation; deepening of grammatical skills, integrated conversation, composition, and reading. Prerequisite: IT 003

IT 302 ADVANCED GRAMMAR AND LANGUAGE DEVELOPMENT (3) Continuation of IT 301, with emphasis on conversation, composition, and introduction to Italian culture. Prerequisite: IT 301

IT 350 MASTERPIECES OF ITALIAN LITERATURE (3) The literature of Italy from the origins to the end of the Renaissance. Prerequisite: IT 003
IT 395 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
IT 399 (GI) FOREIGN STUDY—ITALIAN (1–12) Advanced training in Italian language skills. Prerequisite: IT 003
IT 415 DANTE (3) Readings in the Divina Commedia and the related lesser works of Dante Alighieri. Prerequisite: IT 350
IT 422 ITALIAN HUMANISM AND THE RENAISSANCE (3) Readings in Petrarca, Boccaccio, and the major writers of the Renaissance. Prerequisite: IT 350
IT 450 NINETEENTH-CENTURY ITALIAN LITERATURE (3) Italian romanticism, Verismo and neoclassicism, their origin and development in the novel, poetry, and drama. Prerequisite: IT 351
IT 460 TWENTIETH-CENTURY ITALIAN LITERATURE (3) Modern and contemporary Italian prose, drama, and poetry. Prerequisite: IT 351
IT 475 MODERN ITALIAN LITERATURE AND CINEMA (3) Focus on silent films, fascism, WWII, Resistance, Neorealism, and reactions against Neorealism.
IT 490 DANTE IN TRANSLATION (3) The reading of Dante's Divine Comedy and selected minor works. Prerequisite: junior standing or permission of instructor
IT 494 RESEARCH PROJECT (1–12)
IT 496 INDEPENDENT STUDIES (1–18)
IT 497 SPECIAL TOPICS (1–9)

JAPANESE (JAPNS)

College of the Liberal Arts

JAPNS 001 ELEMENTARY JAPANESE I (4) Introduction to modern Japanese; development of audio-lingual facility and ability to read and write Japanese without aid of romanization.
JAPNS 002 ELEMENTARY JAPANESE II (4) Continuation of elementary Japanese, with emphasis on improving audio-lingual facility and strengthening reading and writing skills in modern Japanese. Prerequisite: JAPNS 001
JAPNS 003 INTERMEDIATE JAPANESE (4) Continued study of modern Japanese at elementary level; extensive audio- lingual practice for conversational fluency; reading/writing original scripts. Prerequisite: JAPNS 002
JAPNS 097 SPECIAL TOPICS (1–9)
JAPNS 099 (GI) FOREIGN STUDY (1–12) Courses offered in foreign countries by individual or group instruction.
JAPNS 110 CONVERSATION, READING, AND COMPOSITION (3) Readings in selected Japanese literature and other texts; practice in conversation and composition. Prerequisite: JAPNS 003
JAPNS 120 (GH;GI) JAPANESE LITERATURE IN ITS CULTURAL CONTEXT (3) Japanese literature and film from classical through contemporary times, with attention to changing cultural settings. Taught in English.
JAPNS 197 SPECIAL TOPICS (1–9)
JAPNS 199 (GI) FOREIGN STUDY—BASIC JAPANESE (1–8) Small group instruction in spoken and written modern Japanese at the introductory level.
JAPNS 294 RESEARCH PROJECT (1–12)
JAPNS 295 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
JAPNS 296 INDEPENDENT STUDIES (1–18)
JAPNS 297 SPECIAL TOPICS (1–9)
JAPNS 299 (GI) FOREIGN STUDY—INTERMEDIATE JAPANESE (1–12) Small group instruction in spoken and written modern Japanese at the intermediate level. Prerequisite: JAPNS 002
JAPNS 395 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
JAPNS 397 SPECIAL TOPICS (1–9)
JAPNS 399 (GI) FOREIGN STUDY (1–12) Courses offered in foreign countries by individual or group instruction.
JAPNS 401 ADVANCED CONVERSATION (3 per semester, maximum of 6) Emphasis on oral proficiency through discussions of aspects of contemporary Japanese culture. Prerequisite: JAPNS 110
JAPNS 402 ADVANCED READING (3 per semester, maximum of 6) Readings in representative works of traditional and modern literature; practice in composition; study of aspects of Japanese culture. Prerequisite: JAPNS 110
JAPNS 403W PRACTICAL WRITTEN COMMUNICATION: JAPANESE FOR PROFESSIONAL AND ACADEMIC PUR POSES I (3) Discussions, presentations, readings, and compositions emphasizing written styles used in newspapers, magazines, business reports, academic writing, and other texts. Prerequisite: JAPNS 402

JAPNS 404 PRACTICAL WRITTEN COMMUNICATION: JAPANESE FOR PROFESSIONAL AND ACADEMIC PUR POSES II (3) Continuation of emphasis on written styles used in newspapers, magazines, business reports, academic writing, and other texts; aspects of translation. Prerequisite: JAPNS 403W
JAPNS 452 CONTEMPORARY JAPAN: CULTURES, LIFESTYLES, TRENDS (3–6) Survey of aspects of modern Japanese society; includes readings from Japanese newspapers, magazines, and fiction; topics may vary each semester. Prerequisite: JAPNS 110
JAPNS 453 JAPANESE FILM (3–6) Selected films and directors representing various aspects of Japanese culture and cinema; topics may vary each semester. Prerequisite: JAPNS 110
JAPNS 454 JAPANESE LITERATURE (3–6) Selected works from important Japanese texts representing genres such as autobiography, poetry, fiction, and drama; topics may vary each semester. Prerequisite: JAPNS 110
JAPNS 494 RESEARCH PROJECT (1–12)
JAPNS 496 INDEPENDENT STUDIES (1–18)
JAPNS 497, 498 SPECIAL TOPICS (1–9)
JAPNS 499 (GI) FOREIGN STUDY—ADVANCED JAPANESE (1—15) Small group instruction in spoken and written modern Japanese at the advanced level. Prerequisite: JAPNS 110 or JAPNS 299

JEWISH STUDIES (J ST)

College of the Liberal Arts

J ST (GH;DF) (CAMS;RL ST) JEWISH AND CHRISTIAN FOUNDATIONS (3) Introduction to the perspectives, patterns of worship, morality, historical roots, and institutions of the Judaeo-Christian traditions; their relationship to culture.
J ST 005 (ANTH) MEDITERRANEAN PREHISTORY (3) Archaeology of the circum-Mediterranean area, from the Middle Pleistocene through the third millennium B.C., emphasizing the evolution of regional cultures.
J ST 010 (GH;GI) (HEBR) JEWISH CIVILIZATION (3) Life of the Jewish people from biblical times; emphasizing cultural, religious, and institutional developments.
J ST 012 (GH;GI) (CAMS;RL ST) LANDS OF THE BIBLE (3) Textual and archaeological evidence for the lands, cities, and peoples associated with the Hebrew Bible and Christian scriptures.
J ST 083S (GH;GI) FIRST-YEAR SEMINAR IN JEWISH STUDIES (3) Critical approaches to the history, sociology, and literature of Jewish Studies.
J ST 097, 098 SPECIAL TOPICS (1–9)
J ST 102 (GH;GI) (CAMS;HIST;RL ST) CANAAN AND ISRAEL IN ANTIQUITY (3) Political, social, and intellectual history of the land of Canaan/Israel in the Biblical era: Late Bronze and Iron Ages.
J ST 110 (GH;GI) (CAMS;RL ST) HEBREW BIBLE: OLD TESTAMENT (3) Introduction to the history, literature, and religion of ancient Israel.
J ST 111 (GH;GI) (CAMS;RL ST) EARLY JUDAISM (3) Religious thought, practices, and parties in the Second Temple period; the emergence of rabbinic Judaism.
J ST 114 (GH;GI) (RL ST) MODERN JUDAISM (3) Trends in Jewish life and thought since the French revolution; Judaism's responses to the challenge of modernity.
J ST 118 (HIST) MODERN JEWISH HISTORY: 1492 TO PRESENT (3) Jewish social and political history from 1492 to the present.
J ST 120 (GH) (CAMS;RL ST) NEW TESTAMENT (3) Introduction to the history, literature, and religion of early Christianity in the Jewish-Hellenistic setting.
J ST 121 (GH;GI) (HIST) HISTORY OF THE HOLOCAUST 1933-1945 (3) Historical analysis of holocaust themes.
J ST 124 (GH;GI) (CAMS;RL ST) EARLY AND MEDIEVAL CHRISTIANITY (3) Analysis in cultural context of selected thinkers, ideas, and movements in Christianity from the second through the fifteenth century.
J ST 133 (GH) (CAMS;RL ST) ARCHAEOLOGY OF THE LEVANT AND ANCIENT ISRAEL (3) Archaeology of the Levant and Ancient Israel to c. 1000 B.C.E.; relationship between archaeological and textual evidence.
J ST 134 (GH;GI) (CAMS;RL ST) ARCHAEOLOGY OF BIBLICAL ISRAEL (3) Archaeology of Biblical Israel from 1200 B.C.E. to c. 640 C.E.; relationship between archaeological and textual evidence.
J ST 170 (RL ST) DEATH AND AFTERLIFE IN THE BIBLICAL ERA (3) Changing concepts of death and the afterlife in the Jewish and Christian traditions c. 1500 B.C.E.-300 C.E.
J ST 197, 198 SPECIAL TOPICS (1–9)
J ST 199 (GI) FOREIGN STUDIES (1–12)
J ST 235 (HIST;RL ST) THE CHURCH AND THE JEWS (3) Examination of the relationship between Western church and the Jews from the First Century to Enlightenment.
J ST 294 RESEARCH PROJECTS (1–12) Supervised student activities on research projects identified on an individual or small-group basis.
J ST 295 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
J ST 296 INDEPENDENT STUDIES (1–18)
J ST 297, 298 SPECIAL TOPICS (1–9)
J ST 299 (GI) FOREIGN STUDIES (1–12)

J ST 395 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
J ST 397 SPECIAL TOPICS (1–9)
J ST 398 SPECIAL TOPICS (1–9)
J ST 399 (GI) FOREIGN STUDIES (1–12)
J ST 401 (DF) (HIST) ANCIENT TECHNOLOGIES AND SOCIO-CULTURAL HISTORY IN THE ANCIENT LEVANT (3) Social and intellectual development in the Ancient Levant as they affected and were affected by technological development. Prerequisite: RL ST 110
J ST 409W (GI) (HIST;RL ST) EUROPEAN ANTI-SEMITISM FROM ANTIQUITY TO THE PRESENT (3) Surveys the history of anti-Semitism in Europe from antiquity through the Middle Ages to the present.
J ST 410 (HIST;RL ST) JEWS IN THE MEDIEVAL WORLD (3) Trends in medieval Jewish society under Islam and Western Christendom.
J ST 411 (DF) (RL ST) JEWISH STUDIES (3) Study of the life and thought of a particular period or movement in the history of Judaism. Prerequisite: 3 credits in religious studies
J ST 412 (RL ST) AMERICAN JUDAISM (3) The development of Jewish religion and culture in America from the colonial era to the present. Prerequisite: HEBR 010 or J ST 010
J ST 416 (HIST) ZIONIST HISTORY 1890-1948 (3) History of Zionist thought and politics to the foundation of Israel 1948.
J ST 420 (ANTH) ARCHAEOLOGY OF THE NEAR EAST (3) Culture of the Near East and India from Paleolithic times through the Bronze Age. Prerequisite: ANTH 008, ANTH 009, ANTH 011, or ANTH 012
J ST 424H (HIST;PHIL;RL ST) MONOTHEISM AND THE BIRTH OF THE WEST (3) The birth of monotheism and its relation to social organization, the idea of individuality, and science. Prerequisite: J ST 004, J ST 102, J ST 110, or J ST 120
J ST 426 (ADM J;HIST) JEWISH/AMERICAN ORGANIZED CRIME IN NEW YORK CITY (3) History of Jewish/American organized crime in New York City from 1890 through the Great Depression.
J ST 480 (CAMS) GREEKS AND PERSIANS (3) Development and achievements of the Achaemenid kingdom; relationships between Persians and Greeks. Prerequisite: CAMS 010, CAMS 025, or CAMS 100
J ST 484 INTERDISCIPLINARY APPROACHES IN JEWISH STUDIES (3) An interdisciplinary approach to problems in Jewish Studies, including Art History, Literature, and Sociology. Prerequisite: J ST 010
J ST 494 RESEARCH PROJECTS (1–12) Supervised student activities on research projects identified on an individual or small-group basis.
J ST 495 INTERNSHIP (1–18)
J ST 496 INDEPENDENT STUDIES (1–18)
J ST 497, 498 SPECIAL TOPICS (1–9)
J ST 499 (GI) FOREIGN STUDIES (1–12)

KEYBOARD, MUSIC (KEYBD)

College of Arts and Architecture
See **www.psu.edu/bulletins/bluebook**, University Course Descriptions button.

KINESIOLOGY (KINES)

College of Health and Human Development
PROFESSIONAL COURSES
The following courses are designed for the major in Kinesiology and related disciplines as designated in the various curricular programs. They are pedagogically oriented and do not fulfill the Health Sciences and Physical Education (GPE) component of General Education.
KINES 001 (GHA) INTRODUCTION TO OUTDOOR PURSUITS (1.5) Introduction to selected outdoor pursuit activities, such as, but not limited to, rock climbing, cross country skiing, backpacking, hiking, orienteering.
KINES 003 DRUGS IN SPORTS (1) Nature of drug use, misuse, and abuse in the athletic setting with implications for counseling and controls.
KINES 004 (GHA) PRINCIPLES OF FLY TYING AND FLY FISHING FOR TROUT (1.5) A course designed to enhance student's knowledge, skill, and performance in fly tying and the sport of fly fishing for trout.
KINES 005 HEALTH ASPECTS OF SPORT (1) Basic principles and concepts of safety, health, and fitness for recreation and sport.
KINES 006 (GHA) CYCLING (1.5) A course designed to give students an understanding of and the ability to establish an exercise program involving riding.
KINES 008 (GHA) COMPETITION CASTING (1.5) A course designed to enhance student's knowledge, skills, and performance in all forms of casting for sport fishing.
KINES 010 (GHA) INDOOR ROCK CLIMBING (1.5) A course designed to provide students with the basic skills, safety, and knowledge of rock climbing.
KINES 010A (GHA) LEAD ROCK CLIMBING (1.5) A course designed to provide students with skills, safety, and knowledge of lead rock climbing in a top rope environment. Prerequisite: KINES 010 or with permission of program

KINES 011 (GHA) BASIC DOWNHILL SKIING (1) Students will gain a comprehensive understanding and basic level of proficiency in Downhill Skiing.
KINES 011A (GHA) INTERMEDIATE DOWNHILL SKIING (1) Students will gain a comprehensive understanding and intermediate to advanced level of proficiency in Downhill Skiing.
KINES 012 (GHA) SNOWBOARDING (1) Students will gain a comprehensive understanding and basic level of proficiency in Snowboarding.
KINES 013 (GHA) FIRST AID, PERSONAL SAFETY, AND CPR (1) A course designed to provide students with the opportunity for Red Cross certification in Community First Aid, Safety, and CPR.
KINES 015 LIFESTYLES FOR HEALTH (1) Concepts of health, life-style, and risk factors; development and implementation of personal action plans.
KINES 017 (GHA) BALLROOM DANCE (1.5) A course designed to provide students with basic dance skills and an understanding and appreciation of ballroom dance.
KINES 019 (GHA) JAZZ DANCE (1.5) A course designed to teach the basic skills of jazz dance and develop a further appreciation of jazz dance.
KINES 020 (GHA) MODERN DANCE (1.5) A course designed to teach the basic skills of modern dance and to develop a further appreciation of modern dance.
KINES 024 (GHA) INTRODUCTION TO LIFETIME SPORTS (1.5) Students participate in lifetime sports such as archery, bowling, golf, and at least one racquet and/or winter sport.
KINES 025 (GHA) INTRODUCTION TO COURT SPORTS (1.5) A course designed to introduce students to various court sports such as tennis, racquetball, handball, squash, and/or badminton.
KINES 026 (GHA) ARCHERY/INDOOR & OUTDOOR (1.5) Course designed to introduce students to Archery/Bowhunting.
KINES 027 (GHA) BADMINTON 1 (1.5) The course promotes health, fitness, and enjoyment of the game of badminton.
KINES 028 (GHA) FENCING I (1.5) Kinesiology 028 is designed to give students knowledge of the rules, strategies and skills of the sport of Fencing.
KINES 029 (GHA) GOLF I (1–1.5) A course designed to give students an understanding of and a proficiency in golf skills, rules, and etiquette.
KINES 029A (GHA) GOLF II (1.5) A course designed to provide a further understanding of and a more advanced proficiency in golf skills, rules and etiquette. Prerequisite: KINES 029 or equivalent
KINES 041 (GHA) HANDBALL (1.5) A course designed to introduce students to a basic instructional course in the fundamentals of 4-wall handball.
KINES 042 (GHA) ICE SKATING—BEGINNING (1.5) A course of instruction focused on the physical development and knowledge of basic ice skating skills.
KINES 042A (GHA) ICE SKATING—ADVANCED BEGINNING (1.5) A course of instruction focused on the physical development and knowledge of basic ice skating skills. Prerequisite: KINES 042 or some experience with the activity
KINES 042B (GHA) ICE SKATING—INTERMEDIATE/ADVANCED (1.5) A course of instruction in basic figure skating: field moves, freestyle, choreography, pairs skating, and ice dance. Prerequisite: KINES 042 and/or KINES 042A, or equivalent skating experience
KINES 043 (GHA) POWER SKATING (1.5) A course of instruction in basic power skating specifically designed for ice hockey, applicable to other ice sports. Prerequisite: KINES 042 or KINES 042A, or equivalent skating experience
KINES 044 (GHA) RACQUETBALL I (1–1.5) The course promotes health, fitness, and enjoyment of the game of racquetball.
KINES 045 (GHA) NAUI BASIC SCUBA (1.5) A course to introduce students to the fundamentals of Scuba diving. Prerequisite: meet NAUI standards and/or by permission of the instructor
KINES 046 (GHA) SQUASH I (1–1.5) A course designed to give students an appreciation of and proficiency in the skills, rules, and regulations of squash.
KINES 047 (GHA) BEGINNING SWIMMING (1.5) A course designed to give students skills and knowledge necessary to be safe in shallow and deep water.
KINES 047A (GHA) ADVANCED BEGINNER SWIMMING (1.5) A course designed to give students skills and knowledge necessary to be safe in shallow and deep water. Prerequisite: students should be comfortable in shallow and deep water and be moderately proficient in front crawl, elementary backstroke, sidestroke, and breaststroke
KINES 047B (GHA) INTERMEDIATE SWIMMING (1.5) A course designed to teach students a variety of swimming strokes and increase their knowledge of fitness using aquatic activities. Prerequisite: KINES 047A or equivalent skills; students should be safe in deep water and have proficiency in the front crawl, elementary backstroke, sidestroke, and breaststroke
KINES 048 (GHA) TENNIS I (1.5) A course designed to give students an appreciation of and proficiency in the skills, rules, and regulations of tennis.
KINES 048A (GHA) TENNIS II (1.5) A course designed to give students an appreciation of and proficiency in the skills, rules, and regulations of tennis. Prerequisite: KINES 048 or for students who demonstrate reasonable consistency in depth and placement of ground strokes and the serve and who have not had instruction at Penn State.
KINES 054 (GHA) AIKIDO (1.5) Students will gain a comprehensive understanding and basic level of proficiency in the Japanese Traditional martial art of Aikido.

KINES 055 DANCE FORMS (1.5) Baskic skills and methods of teaching and assessing creative movement and folk, square, social, and modern dance.
KINES 056 (GHA) INTRODUCTION TO MARTIAL ARTS (1.5) A course designed to give students an introduction to martial arts, and the use of martial arts for lifelong fitness.
KINES 058 (GHA) JUDO I (1.5) Kinesiology 058 will help students develop stamina, confidence and discipline, and promote general fitness through the introduction to basic Judo.
KINES 059 (GHA) INTRODUCTION TO KARATE (1.5) A course designed to give students an understanding of and a proficiency in Karate.
KINES 060 PRINCIPLES AND PRACTICES OF HEALTHFUL LIVING (3) Facts and principles as related and applied to the science of living serve as a basis for health instruction and student guidance.
KINES 061 (GHA) FITNESS THEORY AND PRACTICE (3) Students will learn about the science of fitness/wellness; evaluate their present fitness levels and create a personal fitness plan.
KINES 062 (GHA) INTRODUCTION TO CARDIOVASCULAR ACTIVITIES (1.5) A course designed to give students an introduction to various types of cardiovascular training.
KINES 063 (GHA) AEROBIC DANCE (1.5) A course designed to involve students in daily aerobic activity while teaching the fundamentals of overall health and well-being.
KINES 065 (GHA) JOGGING (1.5) A course designed to give students an understanding of and the ability to establish an exercise program involving jogging.
KINES 067 (GHA) PHYSICAL CONDITIONING (1.5) A course designed to give students an experience with an understanding of vigorous physical training.
KINES 068 (GHA) STRENGTH TRAINING (1.5) Designed to improve students' muscular strength/endurance, teaches students how to develop an effective personal strength/endurance training program for lifelong fitness.
KINES 070 (GHA) SWIM CONDITIONING (1.5) A course designed to provide students an understnding of and proficiency in swimming conditioning. Prerequisite: KINES 047A
KINES 071 (GHA) TRIATHLETE TRAINING (1.5) A course designed to give students a foundation for skills in cross-training: swimming, cycling, and running.
KINES 072 (GHA) FITNESS WALKING (1–1.5) A course designed to give students an understanding of and a proficiency in fitness walking.
KINES 076 (GHA) INTRODUCTION TO TAI CHI CH'UAN (1.5) A course designed to introduce students to Tai Chi Ch'uan, a traditional Chinese system of personal cultivation and self-defense.
KINES 077 (GHA) YOGA 1 (1.5) A course designed to give students an understnding of and proficiency in yoga.
KINES 077A (GHA) ADVANCED YOGA (1.5) A course designed to expand on a student's fundamental understanding of and proficieny in yoga. Prerequisite: KINES 077
KINES 081 (GHA) WELLNESS THEORY (3) Focused on preparing and engaging students in the attitudes and behaviors that enhance quality of life and maximize personal potential.
KINES 082 (GHA) ACTION METHODS FOR STRESS MANAGEMENT (3) Achieving wellness by studying the effects of stressors on systems of the body and effectiveness of activity to relieve stress.
KINES 083 (GHA) EXERCISE FOR STRESS MANAGEMENT (1.5) A course designed to identify the factors that contribute to student stress and develop strategies that will manage these factors. Students who receive credit for KINES 083 will not receive credit for KINES 082.
KINES 084 (GHA) FITNESS FOR LIFE (1.5–2) A course designed to give students an understanding of the fundamental principles of physical fitness. Students who receive credit for KINES 084 shall not receive credit for either KINES 061 or 081.
KINES 088 (GHA) VARSITY SPORT EXPERIENCE (2) A course designed to promote an active and healthful lifestyle through participation in a varsity sport sanctioned by Penn State.
KINES 089 (GHA) STUDENT WILDERNESS EXPERIENCE (3) Incoming student wilderness experience. Backpacking and one additional adventure: rock climbing, high ropes course/canoeing. One-day of community service.
KINES 090 (GHA) INTRODUCTION TO TEAM SPORTS/INDOOR (1–1.5) A course designed to introduce students to indoor team sports.
KINES 090A (GHA) INTRODUCTION TO TEAM SPORTS/INDOOR–VOLLEYBALL (1.5 per semester) A course designed to introduce students to the team sport of volleyball.
KINES 090B (GHA) INTRODUCTION TO TEAM SPORTS/INDOOR–BASKETBALL (1.5 per semester) A course designed to introduce students to the team sport of basketball.
KINES 090C (GHA) INTRODUCTION TO TEAM SPORTS/INDOOR–TEAM HANDBALL (1.5 per semester) A course designed to introduce students to the sport of team handball.
KINES 091A (GHA) INTRODUCTION TO TEAM SPORTS / OUTDOOR–SOCCER (1.5 per semester) A course designed to introduce students to the outdoor team sport of Soccer.
KINES 091B (GHA) INTRODUCTION TO TEAM SPORTS / OUTDOOR–SPEEDBALL (1.5 per semester) A course designed to introduce students to the outdoor team sport of Speedball.
KINES 091C (GHA) INTRODUCTION TO TEAM SPORTS / OUTDOOR–RUGBY (1.5 per semester) A course designed to introduce students to the outdoor team sport of Rugby.
KINES 091D (GHA) INTRODUCTION TO TEAM SPORTS / OUTDOOR-ULTIMATE FRISBEE (1.5 per semester) A course designed to introduce students to the outdoor team sport of Ultimate Frisbee.
KINES 092 (GHA) ADAPTIVE PHYSICAL EDUCATION (1.5) A course designed to give students with medically defined disabilities an opportunity to maximize their physical potential through individualized programs.

KINES 093 (GHA) MASTERS ACTIVITY (SPORT) (1.5–12) A course that introduces students to movement subcultures by providing the knowledge, habits, and skills for activity across the lifespan. Prerequisite: successful completion of relevant activity course or permission of the instructor

KINES 096 (GHA) INDEPENDENT STUDY IN PHYSICAL ACTIVITY (1–3 per semester) Effective Date: S12004 This course is designed to meet the needs of students to expand Kinesiology experiences beyond the designed course curriculum.

KINES 097 SPECIAL TOPICS (1–9)

KINES 101 INDIVIDUAL SPORT ACTIVITIES (1.5) Introduction to individual sports activities for physical education majors; possible sports include: tennis, golf, track and field, archery, and badminton.

KINES 103 TEAM SPORTS ACTIVITIES (1.5) Introduction to team sports activities for physical education majors; possible sports include: football, basketball, lacrosse, softball, soccer, volleyball, field hockey, team handball.

KINES 105 LIFETIME ACTIVITIES/STRENGTH TRAINING (1.5) Introduction to strength training and lifetime activities for physical education majors.

KINES 107 RHYTHMICS, GYMNASTICS, AND DANCE ACTIVITIES (1.5) Basic movement forms to be applied within a K-12 curriculum; included are rhymics, tumbling, movement to music, and social dance.

KINES 109 PHYSICAL FITNESS ACTIVITIES (1.5) This course will address basic skills and methods for assessing, designing, and teaching fitness activities in the K–12 population.

KINES 111 ADVENTURE/OUTDOOR RECREATIONAL ACTIVITIES (1.5) Introduction to adventure/outdoor recreational activities teaching and assessment strategies for K-12 and community groups.

KINES 120 STRENGTH TRAINING (1.5) Strength training activities and program planning for students and athletes. Prerequisite: KINES 150

KINES 126 THE HEALTH PROGRAM FOR THE ELEMENTARY SCHOOL CHILD (3) Addresses coordinated school health program, policies, and procedures; emphasis on elementary school health instruction. Prerequisite: EDPSY 014

KINES 135 INTRODUCTION TO ATHLETIC TRAINING (3) Foundation of injury recognition and prevention; ethical, legal, and professional issues for the athletic trainer.

KINES 141 PHYSICAL ACTIVITY: HISTORICAL AND CULTURAL (3) Evolution of cultural values in physical activity from antiquity to the present.

KINES 165 HEALTH EDUCATION CONCEPTS (3) Principles of healthy living which are the basis for health instruction in schools and health care settings.

KINES 170 INTRODUCTION TO FITNESS THROUGH PHYSICAL ACTIVITY (3) An exploration of the needs and scientific bases of exercise and lifetime sports for adults.

KINES 180 INTRODUCTION TO KINESIOLOGY (3) The foundation course of the Kinesiology degree, providing an interdisciplinary approach to the study of movement through problem based learning.

KINES 197 SPECIAL TOPICS (1–9)

KINES 200 MUSCLE TRAINING: PHYSIOLOGY, PROGRAMS, TECHNIQUES (3) Physiological basis of strength training emphasizing mechanisms of muscle contraction and growth, program and facility design, and individual exercise technique. Prerequisite: BIOL 141

KINES 202 FUNCTIONAL HUMAN ANATOMY (4) In-depth examination of the, musculoskeletal, nervous, cardiovascular, and respiratory systems, and their relationship to human movement.

KINES 215 HEALTH INSTRUCTION IN THE SCHOOL—CONTENT AND METHOD (3) Methods, materials, and units of instruction. Prerequisite: KINES 060 or KINES 165; and KINES 126

KINES 220 INNER SPORTS: STRATEGIES FOR MAXIMIZING PERFORMANCE (1) Theory and research in competitive anxiety. Identification of athletic goals with training in cognitive skills and strategies to maximize performance. Prerequisite: active participation in competitive sports

KINES 231 ATHLETIC TRAINING CLINICAL PRACTICE I (2) Preparation in basic psychomotor skills required in the clinical practice of athletic training. This is a laboratory fee based course. Prerequisite: or concurrent: BIOL 129, KINES 135

KINES 232 ATHLETIC TRAINING CLINICAL PRACTICE II (3) Preparation in advanced psychomotor skills required in the clinical practice of athletic training. This is a laboratory fee based course. Prerequisite: KINES 231 Concurrent: KINES 334

KINES 233 EMERGENCY CARE IN ATHLETIC TRAINING (3) Introduction into emergency medical care with emphasis on management of common emergency situations occuring during athletic participation. This is a laboratory fee based course. Prerequisite: or concurrent: BIOL 129, KINES 135

KINES 270 FOLK, SQUARE, AND BALLROOM DANCE (1) Techniques, performance analysis, and teaching methods for folk, square, and ballroom dance.

KINES 295A OBSERVATION OF HEALTH AND PHYSICAL EDUCATION IN THE PUBLIC SCHOOLS (1) Introduction to the career of teaching including guided observation of HPE in K-12 public schools. Prerequisite: second-semester standing

KINES 295B CAREERS/OBSERVATIONS IN KINESIOLOGY (1) Introduction to career information and observational experiences in the Kinesiology field. Prerequisite: third-semester standing

KINES 296 INDEPENDENT STUDIES (1–18)

KINES 297, 298 SPECIAL TOPICS (1–9)

KINES 303 (GHA) EMERGENCY CARE–FIRST AID/SAFETY/AED (3) Develop Skills for First Responder Certification in CPR/AED, First Aid and Safety by American Red Cross or National Safety Council.

KINES 304 FIRST AID: INSTRUCTORS (1) Competencies leading to certification for teaching American Red Cross Advanced First Aid and Emergency Care and American Heart Association Cardiopulmonary Resuscitation. Laboratory. Prerequisite: KINES 303

KINES 310 PHYSICAL GROWTH AND MOTOR DEVELOPMENT (3) Study of biologically programmed growth processes and environmental influences leading to attained adult form and biomechanical function. Prerequisite: KINES 180

KINES 321 PSYCHOLOGY OF MOVEMENT BEHAVIOR (3) Basic concepts and application of psychological knowledge for organized sport, physical activity, and athletic training. Prerequisite: KINES 180

KINES 334 MECHANISMS AND EVALUATION OF LOWER BODY ATHLETIC INJURIES (3) Etiology of athletic injuries with scientific and practical rationales for evaluation of injuries to the lower extremity and lumbosacral spine. Prerequisite: BIOL 129, admission to the Athletic Training Option or with special permission. Prerequisite or concurrent: KINES 202

KINES 335 MECHANISMS AND EVALUATION OF UPPER BODY ATHLETIC INJURIES (3) Etiology of athletic injuries with scientific and practical rationales for evaluation of injuries to upper extremity, neck, head, and trunk. Prerequisite: BIOL 129, admission to the Athletic Training Option or with special permission. Prerequisite or concurrent: KINES 202

KINES 336 MEDICAL ASPECTS OF ATHLETIC TRAINING (3) Pathology, assessment, and treatment (including pharmacology) of general medical conditions commonly seen in physically active populations. Prerequisite: KINES 334, KINES 335

KINES 345 MEANING, ETHICS, AND MOVEMENT (3) Development of philosophic reasoning skills to better understand the values of physical activity and ethics in a variety of performance settings. Prerequisite: KINES 141

KINES 350 EXERCISE PHYSIOLOGY (3) Structure and function of the human body as applied to health, wellness, exercise, and sports. Prerequisite: KINES 180, KINES 202,and BIOL 141; or permission by instructory for non-kinesiology majors

KINES 356 ACTIVITY AND DISEASE (3) Examination of hypokinetic disease on human wellness involving identification, assessment, research, and exercise design of human activity for disease prevention. Prerequisite: BIOL 141

KINES 358 ERGOGENIC AIDS (1) Skills development including research identification and evaluation of work-enhancing methods and devices as related to human performance and wellness. Prerequisite: BIOL 141, NUTR 251

KINES 360 MOVEMENT SKILLS (3) Examination of the basic mechanisms and variables that govern the coordina- tion and control of movement and the acquisition of skill. Prerequisite: KINES 180

KINES 380 ELEMENTARY SCHOOL ACTIVITIES (1) Practical experience in and theoretical study of selected activities in physical education for elementary school children.

KINES 382 THEORY, METHODS, AND TEACHING PRACTICUM IN ELEMENTARY PHYSICAL EDUCATION (4) Methods course—philosophy, educational principles, and techniques applied to teaching physical education in the elementary school. Prerequisite: official acceptance into the Department of Kinesiology Teacher Preparation option and 6 credits of KINES activity courses

KINES 384 BIOMECHANICS (3) Basic mechanical knowledge required to understand human movement. Prerequisite: KINES 180 and KINES 202

KINES 390 METHODS/EVALUATION FOR SECONDARY SCHOOL PHYSICAL EDUCATION (4) Methods and evaluation applied to teaching situations in physical education at the secondary level. Prerequisite: EDPSY 101, KINES 382, 6 credits of KINES activity courses

KINES 395A LEADERSHIP PRACTICUM FOR TEACHERS (1) Supervised experiences in guiding individuals and in leading groups in the motor skill learning process. Prerequisite: KINES 390; 6 credits of KINES activity

KINES 395B LEADERSHIP PRACTICUM: KINES (1) Supervised experience in leading/assisting in tasks associated with fitness testing/prescription in a variety of settings. Prerequisite: KINES 295B, fifth-semester standing

KINES 395F PRACTICUM IN ATHLETIC TRAINING (3) Practical experience in the athletic training room and with selected sports activities under direct supervision of the medical staff. Prerequisite: admissin to the Athletic Training Option

KINES 395G PRACTICUM IN ATHLETIC TRAINING (3) Practical experience in the athletic training room and with selected sports activities under direct supervision of the medical staff. Prerequisite: KINES 395F

KINES 395I PRACTICUM IN ATHLETIC TRAINING (3) Practical experience in the athletic training room and with selected sports activities under direct supervision of the medical staff. Prerequisite: KINES 395G

KINES 397, 398 SPECIAL TOPICS (1–9)

KINES 400 ADAPTED PHYSICAL EDUCATION (3) Basic concepts of planning and conducting physical education programs for children with physical, sensory, and/or intellectual impairments. Prerequisite: KINES 202

KINES 402 PHYSICAL ACTIVITIES FOR CHILDREN IN SPECIAL EDUCATION (3) Study of physical and intellectual disabilities peculiar to students in special education programs and activities that may benefit them. Prerequisite: 6 credits in special education

KINES 403 EMERGENCY MEDICAL TECHNOLOGY (4) Theoretical and practical aspects of emergency medical techniques as applied in the pre-hospital environment. Prerequisite: KINES 303 and/or current advanced first aid and cardiopulmonary resuscitation certification

KINES 404 EMERGENCY MEDICAL TECHNOLOGY INSTRUCTOR (2) Educational concepts and skills necessary to present instruction in emergency care; lesson planning, methods of instruction, and evaluation techniques. Prerequisite: KINES 403 with current Pennsylvania Emergency Medical Technician certification

KINES 409 INFLAMMATORY RESPONSES TO INJURY AND ENVIRONMENTAL STRESS (3) An examination of mechanisms involved in the inflammatory response and their relationship to general health, injury, and environmental adaptation. Prerequisite: B M B 251

KINES 420 PSYCHOSOCIAL DIMENSIONS OF PHYSICAL ACTIVITY (3) Discussion of theoretical and empirical findings, structuring a frame of reference for exploring man's involvement in physical activity. Prerequisite: KINES 321 or 3 credits in psychology or sociology

KINES 424 (WMNST) WOMEN AND SPORT (3) An interdisciplinary approach to contemporary issues related to women and sport from historical, physiological, psychological, and sociological perspectives. Prerequisite: PSY 002, PSY 270, PSY 471, SOC 001, or WMNST 001

KINES 431 ISSUES IN ATHLETIC TRAINING (3) Analysis of professional and academic issues related to athletic training; includes medical considerations, legal and professional developments, pertinent current research. Prerequisite: or concurrent: KINES 395I

KINES 434 FOUNDATION OF THERAPEUTIC EXERCISE (3) Principles of therapeutic exercise in an athletic training context. Prerequisite: admission to the Athletic Training Option Concurrent: KINES 435

KINES 435 APPLICATION OF THERAPEUTIC EXERCISE AND REHABILITATION (2) Design and implementation of therapeutic exercise and rehabilitation programs for specific athletic injuries. Prerequisite: admission to the Athletic Training Option Concurrent: KINES 434

KINES 436 INTRODUCTION TO THERAPEUTIC MODALITIES (3) Introduction to the underlying physics, physiological effect, indication, and contraindication in the application of therapeutic modalities for athletic injuries. Prerequisite: admission to the Athletic Training Option Concurrent: KINES 437

KINES 437 APPLICATION OF THERAPEUTIC MODALITIES (2) Development and implementation of appropriate therapeutic modalities as applied to the rehabilitation of athletic injuries. Prerequisite: admission to the Athletic Training Option Concurrent: KINES 436

KINES 438 ADMINISTRATIVE ASPECTS OF ATHLETIC TRAINING (3) Scientific basis for and practical aspects of the prevention and care of athletic injuries including the management of training rooms. Prerequisite: or concurrent: KINES 395I

KINES 438W ADMINISTRATIVE ASPECTS OF ATHLETIC TRAINING (3) Scientific basis for and practical aspects of the prevention and care of athletic injuries including the management of training rooms. Prerequisite: or concurrent: KINES 395I

KINES 439W ETHICS IN SPORT AND SPORT MANAGEMENT (3) Analysis of moral dilemmas in sport and sport management utilizing the tools of ethics. Prerequisite: KINES 345 or 3 credits in humanities

KINES 440 PHILOSOPHY AND SPORT (3) An examination of human nature from the perspective of our participation in sport. Prerequisite: KINES 345 or 3 credits in philosophy

KINES 441 (AMSTD) HISTORY OF SPORT IN AMERICAN SOCIETY (3) Background, establishment, and growth of sport in America from colonial times to the present. Prerequisite: KINES 141 or 3 credits of United States history

KINES 442 (CAMS) SPORT IN ANCIENT GREECE AND ROME (3) An examination of the continuity of sport in ancient Greek and Roman societies. Prerequisite: CAMS 025, CAMS 033, CAMS 140, CAMS 150, CAMS 100 or CAMS 101

KINES 443 THE MODERN OLYMPIC GAMES (3) An analysis of the modern Olympic Games from their inception through the current festival. Prerequisite: KINES 141 or 3 credits of history or philosophy

KINES 444 HISTORY OF ATHLETICS IN HIGHER EDUCATION (3) Origin and development of athletics in American higher education from colonial times to the present. Prerequisite: KINES 141 or 3 credits of American history

KINES 445 ALCOHOL AND DRUG EDUCATION (3) Principles of integration and coordination of alcohol and drug education programs for health education and other health related professions. Prerequisite: 9 credits of health science and/or psychology

KINES 446 (GI) HISTORY OF SPORT IN THE MODERN WORLD (3) History of sport in modern world, ca. A.D. 1500 to present; concentrates on role of sport in societies outside United States. Prerequisite: KINES 141 or 3 credits of non-United States history

KINES 448 COPING WITH LIFE AFTER SPORT (1) Psychosocial concerns affecting student-athletes as they enter the transition period following sport disengagement, focusing on coping interventions. Prerequisite: seventh-semester standing or higher; major or minor in Kinesiology or intercollegiate sport participation

KINES 450 PHYSIOLOGICAL LIMITS IN EXERCISE (3) This course examines physiological function during the stress of maximal or prolonged exercise in conjunction with environmental stress. Prerequisite: KINES 350

KINES 451 WORKSITE HEALTH PROMOTION (3) Nature of drug use, misuse, and abuse in the athletic setting with implications for counseling and controls.

KINES 456 PHYSICAL FITNESS APPRAISAL (4) The basic components of physical fitness, how it can be measured, and how it can be developed. Prerequisite: or concurrent: KINES 350, 3 credits in statistics

KINES 457 EXERCISE PRESCRIPTION AND CASE STUDIES (3) Principles of exercise prescription; application of fitness appraisal based on current practices using evaluation and discussion of case studies. Prerequisite: KINES 350, KINES 456

KINES 460 MOVEMENT DISORDERS (3) Major peripheral and central movement disorders and methods of their treatment. Prerequisite: KINES 360, KINES 384
KINES 461W PLANNING AND PREPARATION FOR PRACTICUM RESEARCH (2) Planning and preparation for research project to be conducted at internship site. Prerequisite: KINES 180, KINES 321; or KINES 350 or KINES 360 or KINES 384
KINES 462W PRACTICUM RESEARCH (2) Completion of research topic at internship site. Prerequisite: KINES 461 Concurrent: KINES 495C
KINES 463 ACQUISITION OF MOTOR SKILLS (3) Examination of principles of motor learning; the application of strategic factors such as: practice types, schedules, augmented information, and motivation. Prerequisite: KINES 360
KINES 481W SCIENTIFIC BASIS OF EXERCISE FOR OLDER ADULTS (3) Study of age-associated physical changes and the effects of exercise on the aging process. Prerequisite: KINES 350
KINES 483 MOTOR PATTERNS OF CHILDREN (3) Development of motor patterns. Fundamentals of movement, basic motor skills, and adaptation of the body to external forces. Prerequisite: KINES 202
KINES 484 ADVANCED BIOMECHANICS (3) The use of advanced biomechanics to provide an in-depth understanding of the principles which underpin human movement. Prerequisite: KINES 384
KINES 485 SCIENCE OF TRAINING ATHLETES (3) Application of scientific data knowledge to analyze sport training. Prerequisite: KINES 350, KINES 384
KINES 486 LEGAL ISSUES IN SPORT (3) Contemporary legal issues in sport and their implications for sport managers. Prerequisite: seventh-semester standing
KINES 488 MECHANICS OF LOCOMOTION (3) This course examines the forces and motions characteristic of locomotion, with emphasis on walking, the most common human activity. Prerequisite: KINES 384, or previous coursework in biomechanics (or mechanics) and musculoskeletal anatomy
KINES 489 INTRAMURAL ATHLETICS (3) Programs of activities, types of competition, scoring, awards, schedules, organization, publicity, and other topics related to intramural athletics in schools and colleges. Prerequisite: 4 credits of activities or teaching experience
KINES 490W CURRICULUM DEVELOPMENT IN HEALTH AND PHYSICAL EDUCATION (3) The content and process of K-12 school health and physical education curriculum development for public school students. Prerequisite: or concurrent: KINES 390
KINES 492W PROGRAMMING FOR BUSINESS AND AGENCIES (3) Fundamentals of program development applied to corporate and private physical fitness businesses. Prerequisite: KINES 395B
KINES 493 PRINCIPLES AND ETHICS OF COACHING (3) Integration of the practical and theoretical knowledge necessary for effective coaching through classroom and field experiences. Prerequisite: KINES 180 or KINES 390
KINES 495A PRACTICUM IN STUDENT TEACHING (14) Supervised teaching of health and physical education in K-12 public schools with seminars focused on transition from student to professional. Prerequisite: KINES 395A, and a grade of C or higher in all required courses in the Teacher Preparation Option
KINES 495B FIELD AND/OR RESEARCH PRACTICUM IN KINESIOLOGY (6–12) Participation under supervision in a field or research practicum. Prerequisite: KINES 395B, seventh-semester standing, 9 credits of 400-level KINES courses, 2.00 cumulative GPA
KINES 495C WELLNESS DEVELOPMENT SPECIALIZATION PRACTICUM (10) Participation under supervision in a health and wellness setting. Prerequisite: KINES 461
KINES 495F FIELD PRACTICUM IN ATHLETIC TRAINING (3) Participation under supervision in a field practicum. Prerequisite: KINES 395I
KINES 496 INDEPENDENT STUDIES (1–18)
KINES 497, 498 SPECIAL TOPICS (1–9)

KOREAN (KOR)

College of the Liberal Arts

KOR 001 ELEMENTARY KOREAN I (4) Listening, speaking, reading, writing Korean: an introduction for beginners; basic structures and vocabulary; cultural elements.
KOR 002 ELEMENTARY KOREAN II (4) Listening, speaking, reading, writing Korean: structures and vocabulary; cultural elements. Prerequisite: KOR 001
KOR 003 INTERMEDIATE KOREAN (4) Further development of listening, speaking, reading, writing skills in Korean; cultural elements. Prerequisite: KOR 002
KOR 097, 197, 297, 397, 498 SPECIAL TOPICS (1–9)
KOR 099, 199, 299, 399, 499 (GI) FOREIGN STUDIES (1–12)
KOR 294, 494 RESEARCH PROJECT (1–12)
KOR 295, 395, INTERNSHIP (1–18)
KOR 296, 496 INDEPENDENT STUDIES (1–18)

LABOR AND INDUSTRIAL RELATIONS (L I R)

College of the Liberal Arts

L I R083S (GS) FIRST-YEAR SEMINAR IN LABOR STUDIES AND INDUSTRIAL RELATIONS (3) Critical approaches to the dimensions and direction in Labor and Industrial Relations.

L I R 100 (GS) INDUSTRIAL RELATIONS (3) Introductory analysis of the employment relationship and of the interrelated interests of managements, workers, unions, and the public.
L I R 136 (GI) (WMNST) RACE, GENDER, AND EMPLOYMENT (3) Industrial relations and legislative and policy responses to labor force issues of racial and gender inequality.
L I R 156 (HIST) HISTORY OF THE AMERICAN WORKER (3) A study of the American worker from the preindustrial era to the present.
L I R 187 LABOR AND INDUSTRIAL RELATIONS FRESHMAN SEMINAR (3) The meaning and advantages of a Liberal Arts education in context of a specific discipline. Prerequisite: first-semester standing and enrollment in the College of the Liberal Arts
L I R 197 SPECIAL TOPICS (1–9)
L I R 199 (GI) FOREIGN STUDIES (1–12)
L I R 201 (GS) EMPLOYMENT RELATIONSHIP: LAW AND POLICY (3) An examination of basic legal principles underlying the employment relationship and their social, political, and economic bases.
L I R 294 RESEARCH PROJECT (1–12)
L I R 296 INDEPENDENT STUDIES (1–18)
L I R 297 SPECIAL TOPICS (1–9)
L I R 299 (GI) FOREIGN STUDIES (1–12)
L I R 312 RESEARCH METHODS IN LABOR STUDIES AND INDUSTRIAL RELATIONS (4) Provides an understanding of social science research as employed in the field of industrial relations and human resources.
L I R 395 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
L I R 399 (GI) FOREIGN STUDIES (1–12)
L I R 400 COMPARATIVE INDUSTRIAL RELATIONS SYSTEMS (3) Analysis of structure and elements of industrial relations systems in developed and developing areas. Prerequisite: 3 credits in labor and industrial relations
L I R 401 THE LAW OF LABOR-MANAGEMENT RELATIONS (3) Development of Anglo-American law regulating collective bargaining, with emphasis on American labor-management relations under Wagner, Taft-Hartley, and other acts. Prerequisite: 3 credits in labor and industrial relations or political science
L I R 404 TRENDS IN INDUSTRIAL RELATIONS (3) Current structural and procedural conditions encouraging stability or conflict in collective bargaining. Prerequisite: ECON 315 or L I R 100
L I R 411 INDUSTRIAL RELATIONS ORGANIZATIONS (3) Organizational factors in the actions of trade unions, other employee organizations, and their consequences for workers and society. Prerequisite: 3 credits in labor and industrial relations or 3 credits in sociology
L I R 414W LABOR AND INDUSTRIAL RELATIONS THEORY (3) Content and implications of major and minor theories of labor and industrial relations. Prerequisite: 6 credits in labor and industrial relations
L I R 424 EMPLOYMENT COMPENSATION (3) Development and management of employee compensation systems. Prerequisite: L I R 201 and sixth-semester standing
L I R 434 COLLECTIVE BARGAINING AND CONTRACT ADMINISTRATION (3) Theory, practice, economic impact of collective bargaining, including administration of the collective bargaining agreement. Prerequisite: L I R 100
L I R 435 LABOR RELATIONS IN THE PUBLIC SECTOR (3) Analysis of labor relations problems within different areas of public employment. Prerequisite: 3 credits in labor and industrial relations
L I R 437 WORKPLACE DISPUTE RESOLUTION (3) Dispute resolution practices and procedures used in the workplace and employment law settings. Prerequisite: L I R 100
L I R 444 OCCUPATIONAL HEALTH: POLICY AND PRACTICE (3) The role of employees, unions, employers, and government in dealing with work-related health issues. Prerequisite: L I R 100 or sixth-semester standing
L I R 458W (HIST) HISTORY OF WORK IN AMERICA (3) A study of selected problems in the history of work in the United States, especially since 1877. Prerequisite: HIST 021, HIST 156, or L I R 100
L I R 460 HUMAN RESOURCES ETHICS (3) Ethics of human resources management. Prerequisite: ARMY 402, H P A 460, HRIM 466, MANGT 340, MANGT 341, MANGT 441, MANGT 463, NAVSC 402, NURS 432, or PSY 231
L I R 464 COMMUNICATION SKILLS FOR LEADERS IN GROUPS AND ORGANIZATIONS (3) Theory- and research-based communication skills for leaders dealing with work-related problems in contemporary groups and organizations.
L I R 465 COLLECTIVE DECISION MAKING (3) Application of theories of decision making to work-related issues in groups and organizations requiring collective resolution and action.
L I R 470 EMPLOYEE INVOLVEMENT (3) Historical, theoretical, legal, and industrial relations aspects of employee involvement in the United States and other countries. Prerequisite: L I R 100
L I R 494 RESEARCH PROJECT (1–12)
L I R 495 LABOR STUDIES INTERNSHIP (1–12)
L I R 496 INDEPENDENT STUDIES (1–18)
L I R 497 SPECIAL TOPICS (1–9)
L I R 499 (GI) FOREIGN STUDIES (1–12)

LANDSCAPE ARCHITECTURE (LARCH)

College of Arts and Architecture

*LARCH 003 (GA) THE NATURAL AND HISTORIC LANDSCAPE (3) Man's changing attitudes toward urban and rural outdoor spaces and their aesthetic and cultural value.

*LARCH 060 (GA) HISTORY OF LANDSCAPE ARCHITECTURE (3) A survey of the historical development of outdoor space in relationship to allied arts from early beginnings to this century.

LARCH 100S LANDSCAPE ARCHITECTURE ORIENTATION SEMINAR (1) Introductory seminar involving readings on significant issues in landscape architecture. LARCH majors only.

LARCH 127 VEGETATION ECOLOGY AND LANDSCAPE DESIGN (3) Application of ecological knowledge to landscape design and management; emphasis on the use of plant communities in contemporary design. LARCH or Landscape Contracting Majors only.

LARCH 129 LANDSCAPE ECOLOGY FOR PLANNING AND DESIGN (3) Application of ecological principles to design and management of environment, with particular emphasis on conservation and restoration of natural resources. For Landscape Architecture majors only. Prerequisite: LARCH 127

LARCH 136 DESIGN VISUALIZATION AND GRAPHICS I (3) Basic design visualization techniques including representation of landscape features, lettering, perspective, and presentation media as employed by the profession. For Landscape Architecture majors only.

LARCH 296 INDEPENDENT STUDIES (1–18)

LARCH 297 SPECIAL TOPICS (1–9)

LARCH 325 DESIGN AND THEORY I: INTRODUCTION TO PRINCIPLES OF LANDSCAPE ARCHITECTURAL DESIGN (3) An introduction to design theories and principles of landscape architecture. LARCH majors only. Prerequisite: LARCH 100S, LARCH 136 Concurrent: LARCH 127, LARCH 325A, LARCH 336

LARCH 325A DESIGN THEORY SEMINAR (1) Inquiry-based reading and discussion of design theory literature relevant to the focus and content of the associated design studio course, LARCH 325. LARCH majors only. Prerequisite: LARCH 100S, LARCH 136 Concurrent: LARCH 127, LARCH 325, LARCH 336

LARCH 327 DESIGN AND THEORY II: INTRODUCTION TO ISSUES OF PLACE (3) Studio design addressing issues of nature and culture; application of theories, processes, and presentation methods learned in course and concurrent courses. LARCH majors only. Prerequisite: LARCH 325, LARCH 336 Concurrent: LARCH 327A

LARCH 327A DESIGN THEORY SEMINAR (1) Inquiry-based reading and discussion of design theory literature relevant to the focus and content of the associated design studio course, LARCH 327. LARCH majors only. Prerequisite: LARCH 325 Concurrent: LARCH 327

LARCH 336 DESIGN VISUALIZATION AND GRAPHICS II (3) Advanced visualization principles and techniques; computer-aided design, image processing, color theory and application; visual thinking and problem solving. For Landscape Architecture majors only. Prerequisite: LARCH 136 Concurrent: LARCH 127, LARCH 325, LARCH 325A

LARCH 400 INTRODUCTION TO DESIGN AND THEORY (IUG) (5) Introductory landscape architectural design and applied theory for IUG students. Prerequisite: admission to the IUG program Concurrent: LARCH 400A

LARCH 400A INTRODUCTION TO DESIGN THEORY SEMINAR (IUG) (1) Introductory landscape architectural design theory seminar for IUG students. Prerequisite: admission to the IUG program Concurrent: LARCH 400

LARCH 410 INTERACTIVE DIGITAL DESIGN: INFORMATION TECHNOLOGY FOR DESIGNERS (3) A student centered paperless interactive digital design studio.

LARCH 425 DESIGN AND THEORY III: SITE PLANNING AND DESIGN (3) An introduction to site planning, management, and design. Prerequisite: LARCH 127, LARCH 327, LARCH 327A Concurrent: LARCH 425A, LARCH 435

LARCH 425A DESIGN THEORY SEMINAR (1) Inquiry-based reading and discussion of design theory literature relevant to the focus and content of the associated design studio course, LARCH 425. LARCH majors only. Prerequisite: LARCH 127, LARCH 327, LARCH 327A Concurrent: LARCH 425, LARCH 435

LARCH 427 DESIGN AND THEORY IV: SITE AND REGIONAL PLANNING (3) An introduction to large site and regional planning. For landscape architecture majors only. Prerequisite: LARCH 425, LARCH 425A Concurrent: LARCH 427A, LARCH 437, LARCH 457

LARCH 427A DESIGN THEORY SEMINAR (1) Inquiry-based reading and discussion of design theory literature relevant to the focus and content of the associated design studio course, LARCH 427. LARCH majors only. Prerequisite: LARCH 425, LARCH 425A Concurrent: LARCH 427, LARCH 437, LARCH 457

LARCH 435 LANDSCAPE ARCHITECTURAL DESIGN IMPLEMENTATION I (3) Principles of landform design and grading, including the use of landform as a design element, visualization and representation of landforms, methods for integrating site and structure, standards for grading and drainage, and the development of detailed grading plans. LARCH majors only. Prerequisite: LARCH 327, LARCH 327A, MATH 026, or higher Concurrent: LARCH 425, LARCH 425A

LARCH 437 LANDSCAPE ARCHITECTURAL DESIGN IMPLEMENTATION II (3) Introduces the principles and techniques of road alignment, including horizontal curves, vertical curves, and superelevation; principles and techniques of site scale layout and dimensioning. For Landscape Architecture majors only. Prerequisite: LARCH 435 Concurrent: LARCH 427, LARCH 427A, LARCH 457

LARCH 444 LANDSCAPE ARCHITECTURE FIELD TRIP (1) A week-long class trip to visit recent projects, offices, and outstanding historical developments. Prerequisite: LARCH 127
LARCH 445 DESIGN AND THEORY V: COMMUNITY DESIGN (4) Landscape analysis, planning and design for human settlements: small urban and non-urban sites. LARCH majors only. Prerequisite: LARCH 427, LARCH 427A Concurrent: LARCH 445A, LARCH 460W
LARCH 445A DESIGN THEORY SEMINAR (1) Inquiry-based reading and discussion of design theory literature relevant to the focus and content of the associated design studio course, LARCH 445. LARCH majors only. Prerequisite: LARCH 427, LARCH 427A Concurrent: LARCH 445, LARCH 460W
LARCH 451 DESIGN AND THEORY VII: URBAN DESIGN (4) Introduction of major urban design theories, issues, and strategies, and development of site and community design concerns. LARCH Majors only. Prerequisite: LARCH 499A, LARCH 499B Concurrent: LARCH 451A
LARCH 451A DESIGN THEORY SEMINAR (1) Inquiry-based reading and discussion of design theory literature relevant to the focus and content of the associated design studio course, LARCH 451. LARCH majors only. Prerequisite: LARCH 499A, LARCH 499B Concurrent: LARCH 451
LARCH 453 DESIGN AND THEORY VIII: ADVANCED LANDSCAPE ARCHITECTURAL DESIGN (4) Review of landscape architectural theories and issues; supports development of comprehensive design study and/or independent honors (Thesis-Based) design projects. LARCH Majors only. Prerequisite: LARCH 451, LARCH 451A Concurrent: LARCH 453A
LARCH 453A DESIGN THEORY SEMINAR (1) Inquiry-based reading and discussion of design theory literature relevant to the focus and content of the associated design studio course, LARCH 453. LARCH majors only. Prerequisite: LARCH 451, LARCH 451A Concurrent: LARCH 453
LARCH 455 DESIGN AND THEORY IX (IUG) (6) Integrated urban design and implementation studio for IUG students. Prerequisite: admission to the BLA/MLA program; LARCH 437, LARCH 453
LARCH 457 PROFESSIONAL PRACTICE (3) An investigation of current professional and business practices in the field of landscape architecture. For Landscape Architecture majors only. Prerequisite: LARCH 425 Concurrent: LARCH 427, LARCH 427A, LARCH 437
LARCH 460W HISTORIC ISSUES IN LANDSCAPE ARCHITECTURE (3) A review of design history (precedent studies), an introduction to historic method, history as an informant to design, reading the historic landscape, and issues of preservation and restoration. Landscape Architecture majors only. Prerequisite: LARCH 060 Concurrent: LARCH 445, LARCH 445A
LARCH 472 PLANNING AND PUBLIC POLICY (3) A review of design and planning movements of this century, with emphasis on the contemporary planning techniques and future trends.
LARCH 495 INTERNSHIP (1–13) Supervised off-campus, non-group instruction including individual field experiences, practicums or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
LARCH 496 INDEPENDENT STUDIES (1–18)
LARCH 497 SPECIAL TOPICS (1–9)
LARCH 499 (GI) FOREIGN STUDIES (1–12)
LARCH 499A (GI) DESIGN THEORY SEMINAR (1) Inquiry-based reading and discussion of design theory literature relevant to the focus and content of the associated design studio course, LARCH 499B. LARCH majors only. Prerequisite: LARCH 445, LARCH 445A, LARCH 460W Concurrent: LARCH 499B, LARCH 499C, LARCH 499D
LARCH 499B (GI) DESIGN AND THEORY VI: CONTEMPORARY/INTERNATIONAL LANDSCAPE ARCHITECTURAL DES IGN ISSUES (4) Study of and design for sites, programs, and social groups associated with ongoing contemporary landscape architectural concerns. LARCH Majors only. Prerequisite: LARCH 445, LARCH 445A, LARCH 460W Concurrent: LARCH 499A, LARCH 499C, LARCH 499D
LARCH 499C (GI) LANDSCAPE ARCHITECTURAL DESIGN IMPLEMENTATION III (3) Introduction to landscape construction materials and their use in design; includes principles and techniques for detailed design of site elements. For Landscape Architecture majors only. Prerequisite: LARCH 437, LARCH 445, LARCH 445A, LARCH 460W Concurrent: LARCH 499A, LARCH 499B, LARCH 499D
LARCH 499D (GI) CONTEMPORARY/INTERNATIONAL SPECIAL TOPICS (4) Special topics related to, and study in conjunction with, LARCH 499A, 499B, and 499C. Landscape Architecture majors only. Prerequisite: LARCH 445, LARCH 445A, LARCH 460W Concurrent: LARCH 499A, LARCH 499B, LARCH 499C
*Students may take only one course for General Education credit from LARCH 003 GA or 060 GA.

LANGUAGE AND LITERACY EDUCATION (LL ED)

College of Education

LL ED 005 COLLEGE READING IMPROVEMENT I (3) Improvement of basic reading skills: vocabulary development; literal and interpretive comprehension; application of these skills more efficiently into college work. Prerequisite: limited to students whose academic profile sheets indicate help in reading is needed
LL ED 010 COLLEGE READING IMPROVEMENT II (3) Development of higher level comprehension, vocabulary, and study skills incorporated into content area reading. Prerequisite: LL ED 005
LL ED 123 CRITICAL READING (3) Critical analysis of nonfiction prose, with practice in using analytical reading skills in comprehending texts of various content areas. Prerequisite: ENGL 015
LL ED 296 INDEPENDENT STUDIES (1–18)
LL ED 297, 298 SPECIAL TOPICS (1–9)

LL ED 400 TEACHING READING IN THE ELEMENTARY SCHOOL (3) Introduction to the reading program; acquaintance with materials and techniques; observations of reading instruction; correlation with human growth and development. Prerequisite: C I 295 for EK ED majors; EDPSY 014, PSY 213; EDTHP 115 or EDTHP selection Concurrent: LL ED 401, LL ED 402 for EK ED majors
LL ED 401 TEACHING LANGUAGE ARTS IN ELEMENTARY SCHOOL (3) Principles, problems, materials, and techniques involved in teaching speaking, listening, writing, and reading in the elementary school. Prerequisite: C I 295 for EK ED majors; EDPSY 014, PSY 213; EDTHP 115 or EDTHP selection Concurrent: LL ED 400, LL ED 402 for EK ED majors
LL ED 402 TEACHING CHILDREN'S LITERATURE (3) Survey of children's literature with an emphasis on the importance of literature in the development of the elementary school curriculum. Prerequisite: C I 295 for EK ED majors; EDPSY 014, PSY 213; EDTHP 115 or EDTHP selection. Concurrent: LL ED 400, LL ED 401 for EK ED majors.
LL ED 411 TEACHING LANGUAGE ARTS IN SECONDARY SCHOOLS I (3) Exploration of language, literacy, and culture and development of curricular designs for teaching language arts in secondary schools. Prerequisite: ENGL 200 or 200-level literature course, ENGL 444 Concurrent: LL ED 420
LL ED 412 TEACHING LANGUAGE ARTS IN SECONDARY SCHOOLS II (3) Exploration of language, literacy, and culture and development of curricular designs for teaching language arts in secondary schools. Prerequisite: LL ED 411 Concurrent: C I 412W
LL ED 420 ADOLESCENT LITERATURE AND LITERACY (3) Exploration of adolescent literacy and curricular designs for using the diversity of cultural voices in adolescent literature in secondary schools. Concurrent: LL ED 411
LL ED 424 SEMINAR IN FOREIGN LANGUAGE AND BILINGUAL EDUCATION (3) Contemporary issues in foreign language and bilingual education for prospective and practicing teachers of foreign languages and bilingual education. Prerequisite: 12 credits or 12-credit level proficiency in the target language
LL ED 425 METHODS OF TEACHING IN BILINGUAL EDUCATION (3) Methods, techniques, materials, and language laboratory in dual-language instruction. Prerequisite: LL ED 424
LL ED 445 TEACHING ENGLISH IN BILINGUAL/DIALECTAL EDUCATION (3) Theories, techniques, materials for teaching English speaking, reading, and writing to bilingual and nonnative speakers in elementary and secondary schools. Prerequisite: LL ED 424 or LL ED 425
LL ED 446 REMEDIAL READING IN THE CLASSROOM (3) Exploration of reading difficulties in the regular classroom; use of assessment information in the design and delivery of appropriate instruction. Prerequisite: LL ED 440 OR LL ED 500
LL ED 450 CONTENT AREA READING (3) Study of reading skills and materials for specific content areas; diagnostic and instructional procedures for classroom teachers. Prerequisite: EDPSY 014 or PSY 213 or teaching experience
LL ED 467 CHILDREN'S LITERATURE IN THE CLASSROOM (3) Study of the theory and practice of using children's literature in the elementary school classroom. Prerequisite: LL ED 400 OR LL ED 402
LL ED 480 MEDIA LITERACY IN THE CLASSROOM (3) Exploration of media languages and literacy in classrooms, learning in an electronic age; issues, ideas, and teaching strategies. Concurrent: LL ED 411, LL ED 420
LL ED 495 SCHOOL PRACTICUM IN READING (1–18) Supervised practicum providing field experiences at any grade level, with opportunities to assume various teaching roles. Prerequisite: LL ED 400
LL ED 496 INDEPENDENT STUDIES (1–18)
LL ED 497, 498 SPECIAL TOPICS (1–9)

LATIN (LATIN)

College of the Liberal Arts

Knowledge of Greek or Latin not required. *See also Classics and Mediterranean Studies and Greek.*
LATIN 001 ELEMENTARY LATIN (4) Pronunciation; inflections; simple rules of syntax.
LATIN 002 ELEMENTARY LATIN (4) Advanced syntax and sentence structure. Prerequisite: LATIN 001
LATIN 003 INTERMEDIATE LATIN (4) Selected readings from representative authors. Prerequisite: LATIN 002
LATIN 099 (GI) FOREIGN STUDIES (1–12)
LATIN 197, 297, 497 SPECIAL TOPICS (1–9)
LATIN 199, 299, 399, 499 (GI) FOREIGN STUDIES (1–12)
LATIN 294, 494 RESEARCH PROJECT (1–12)
LATIN 296, 496 INDEPENDENT STUDIES (1–18)
LATIN 395 INTERNSHIP (1–18)
LATIN 400 LATIN PROSE COMPOSITION (3) Latin style and stylistics as examined and appreciated through standard exercises in composition and parallel selected prose readings. Prerequisite: LATIN 003 or 12th-credit level of proficiency
LATIN 402 REPUBLICAN LITERATURE (3–12) Selected works by Plautus, Lucretius, Catullus, Cicero (content varies). Prerequisite: LATIN 003
LATIN 403 AUGUSTAN AGE LITERATURE (3–12) Selected works by Virgil, Horace, Propertius, Tibullus, Ovid, Livy (content varies). Prerequisite: LATIN 003
LATIN 404 SILVER AGE LITERATURE (3–12) Selected works by Petronius, Seneca, Tacitus, Juvenal, Martial, Pliny the Younger (content varies). Prerequisite: LATIN 003

LATIN 420 MEDIEVAL LATIN LITERATURE (3–6) Survey of Medieval Latin literature. Prerequisite: LATIN 003
LATIN 450W HISTORY OF LATIN (3) History of the Latin language and its speakers, from their origins to the 2nd century C.E. Prerequisite: LING 102; LATIN 401, LATIN 402, or LATIN 403

LATIN AMERICAN STUDIES (LATAM)

College of the Liberal Arts
LATAM 395 INTERNSHIP (1–18)

LIBERAL ARTS (L A)

College of the Liberal Arts
L A 097, 098; 197, 198; 297, 298; 397, 398; 497, 498 SPECIAL TOPICS (1–9)
L A 199, 499 (GI) FOREIGN STUDY—LIBERAL ARTS (1–9) Study in selected foreign countries of the cultural, institutional, and/or social development of the host country.
L A 294, 494 RESEARCH PROJECT COURSES (1–12 per semester)
L A 295 UNDERGRADUATE FIELD EXPERIENCE OR PRACTICUM (1–18) Approved experience, related to student career objectives, in agencies external to the University.
L A 296, 496 INDEPENDENT STUDIES (1–18)
L A 299 (GI) FOREIGN STUDIES (1–12)
L A 395 INTERNSHIP (1–18)
L A 399 (GI) FOREIGN STUDIES (1–12)
L A 400 CHANGING LIFE-STYLES (1) Guest lecturers address the subject of futurism and impact of changes on individuals and society from different academic perspectives.
L A 401 PROFESSIONAL DEVELOPMENT FOR THE LIBERAL ARTS STUDENT (1) Provides Liberal Arts students with the techniques and information necessary to specify and implement postgraduation educational and career plans.
L A 495 UNDERGRADUATE FIELD EXPERIENCE OR PRACTICUM (1–12) Approved experience, related to student career objectives, in agencies external to University.

LIBRARY STUDIES (L ST)

College of the Liberal Arts
L ST 097, 098; 197, 198; 297, 298; 397, 398; 497, 498 SPECIAL TOPICS (1–9)
L ST 098 SPECIAL TOPICS (1–9)
L ST 100 INFORMATION SEARCH STRATEGY (1) Concepts and methodology for determining informational needs and planning efficient strategies to locate information in a library. Prerequisite: or concurrent: ENGL 015 or ENGL 030
L ST 101S STORIES AND STORYTELLING: HOW HUMANS BECOME PEOPLE (3) This first-year seminar uses story and collaborative storytelling to examine how knowledge is organized, found, evaluated, used, and communicated.
L ST 101T STORIES AND STORYTELLING: HOW HUMANS BECOME PEOPLE (3) This first-year seminar uses story and collaborative storytelling to examine how knowledge is organized, found, evaluated, used, and communicated.
L ST 110 INFORMATION ORGANIZATION AND RETRIEVAL (3) Information structure and resource related to search and problem-solving procedures to identify, organize, and locate print and nonprint materials. Prerequisite: ENGL 015 or ENGL 030
L ST 294 RESEARCH PROJECTS (1–12) Emphasis will be on the identification, on-line and manual retrieval, and evaluation of print and nonprint resources for specific subjects.
L ST 296, 496 INDEPENDENT STUDIES (1–18)
L ST 301H INFORMATION RESEARCH METHODS AND SYSTEMS (1) Survey of information theories, structures and resources as related to library research methods for social, behavioral sciences and the humanities.
L ST 306 BUSINESS INFORMATION SOURCES (1) Accessing information for commercial enterprise using sources other than private company files. Prerequisite: 6 credits in one of the following: accounting, business administration, business law, business logistics, finance, insurance, international business, management, management information systems, marketing or real estate
L ST 460 INTRODUCTION TO LIBRARY RESOURCES IN THE BIOMEDICAL SCIENCES (1) Use of bibliographic resources for in-depth research in biomedical libraries. Covers indexes, abstracts, reference books, and on-line search services.
L ST 470 RESEARCH METHODS FOR LAW AND GOVERNMENT INFORMATION RESOURCES (3) Analysis of federal and legal information resources focusing on bibliographic access. Prerequisite: 6 credits in political science, history, or sociology
L ST 480 BIBLIOGRAPHIC RESOURCES AND SYSTEMS (3) Survey of information resources, especially computerized bibliographic data files, available from commercial and governmental sources. Prerequisite: ENGL 015
L ST 490 (HIST) ARCHIVAL MANAGEMENT (1–3) Introduction to the principles and procedures in the management of archives and historical manuscripts.

L ST 494 RESEARCH PROJECTS (1–12) Emphasis will be on the identification, on-line and manual retrieval, and evaluation of print and nonprint resources for specific subjects.
L ST 495 INTERNSHIP (1–9) Directed internship in library studies, archival administration, rare books curation and/or preservation. Prerequisite: L ST 490 or L ST 496

LINGUISTICS (LING)

College of the Liberal Arts
LING 001 (GS;GI) THE STUDY OF LANGUAGE (3) A non-technical introduction to the study of human language, and its role in human interaction. Students who have successfully completed LING 100 may not enroll in LING 001.
LING 097, 098; 197, 198; 297, 298; 397, 398; 497, 498 SPECIAL TOPICS (1–9)
LING 100 FOUNDATIONS OF LINGUISTICS (3) Systematic study of linguistic structures in a variety of the world's languages; an overview of language, and its organization.
LING 102 (GH) INTRODUCTION TO HISTORICAL LINGUISTICS (3) How languages change and evolve over time; language families; effects of borrowing and language contact. Prerequisite: LING 010 or LING 100
LING 199, 299, 399, 499 (GI) FOREIGN STUDIES (1–12)
LING 294, 494 RESEARCH PROJECT (1–12)
LING 395 INTERNSHIP (1–18)
LING 401 INTRODUCTION TO LINGUISTIC THEORY (3) A survey of the principles of modern linguistic analysis; current approaches to phonological, morphological, and syntactic methods and analyses.
LING 402 SYNTAX I (3) Principles of grammatical analysis in the generative framework; an overview of syntactic structures across languages.
LING 404 PHONOLOGY I (3) The analysis of the sound systems of human languages; focus on common phonological processes across languages and on phonetics-phonology interface.
LING 446 L1 ACQUISITION (3) How children learn their first language; psycholinguistic aspects of lexical, syntactic, semantic, and phonological development.
LING 447 BILINGUALISM (3) Explores the social and psychological aspects of bilingualism; topics include languages in contact, transference, maintenance, and loss.
LING 448 SOCIOLINGUISTICS (3) Issues in the study of language in its sociocultural context; analysis of social dialects and speech styles.
LING 449 SEMANTICS I (3) The study of meaning in human language; methods of analysis; study of sense, reference, compositionality, quantification, presupposition, and sentence- level meaning.
LING 493 FIELD METHODS (3) Primary linguistic investigation of a language different from English; field work with a native speaker; data gathering; linguistic analysis.
LING 496 INDEPENDENT STUDIES (1–18)

LITERATURE (LIT)

Capital College
LIT 315 APPROACHES TO LITERATURE (3) A study of critical approaches to literature, culminating in the detailed consideration of several works.
LIT 429 SHAKESPEARE (3) Intensive study of the major plays and selected sonnets. Prerequisite: 6 credits of English
LIT 440 LITERARY GENRES (3 per semester) The study of one of the major literary genres. (May be repeated for credit.)
LIT 470 TOPICS IN NINETEENTH-CENTURY BRITISH LITERATURE (3 per semester) Focused study of a particular genre, theme, or problem in the Romantic and/or Victorian periods. (May be repeated for credit.) Prerequisite: 6 credits of English
LIT 480 TOPICS IN NINETEENTH-CENTURY AMERICAN LITERATURE (3 per semester) Focused study of a particular genre, theme, or problem in nineteenth-century American literature. (May be repeated for credit.) Prerequisite: 6 credits of English
LIT 482 (DF) AFRICAN/AMERICAN LITERATURE (3) A study of selected works by African/American writers. Prerequisite: 6 credits of English

MANAGEMENT (MANGT)

Penn State Erie, The Behrend College
MANGT 197 SPECIAL TOPICS (1–9)
MANGT 294 RESEARCH PROJECT (1–12)
MANGT 296 INDEPENDENT STUDIES (1–18)
MANGT 297 SPECIAL TOPICS (1–9)
MANGT 300 BEHAVIORAL CONCEPTS FOR MANAGEMENT (3) Introduction to behavioral concepts and theories relevant to problems and issues facing managers. Prerequisite: fifth-semester standing
MANGT 300W BEHAVIORAL CONCEPTS FOR MANAGEMENT (3) Introduction to behavioral concepts and theories relevant to problems and issues facing managers. Prerequisite: ACCTG 211, B A 243, ECON 002, ECON 004, M I S 204, MS&IS 200

MANGT 310 INTRODUCTION TO OPERATIONS MANAGEMENT (3) An introduction to the strategic importance and the analytic tools of operations management. Prerequisite: MS&IS 200 or STAT 200; fifth-semester standing
MANGT 320 ORGANIZATION AND PEOPLE (3) Study of theories and their applications relevant to individual and group behavior in organizations. Prerequisite: MANGT 300
MANGT 330 ORGANIZATIONAL PROCESSES AND STRUCTURE (3) The analysis of organizational processes and structures focusing on the organization and its environment as the fundamental units of analysis. Prerequisite: MANGT 300
MANGT 340 (GI) INTRODUCTION TO HUMAN RESOURCE MANAGEMENT (3) Analyzes strategic human resource issues and personnel administration practices and procedures within the broader context of effectively managing cultural diversity. Prerequisite: MANGT 300
MANGT 350 PROBLEM SOLVING AND MODELS FOR MANAGEMENT (3) A hands-on introduction to modeling and solving typical business problems using commonly used techniques and software tools. Prerequisite: MS&IS 200 or STAT 200; fifth-semester standing
MANGT 397 SPECIAL TOPICS (1–9)
MANGT 410 PROJECT MANAGEMENT (3) A problem-based, interdisciplinary course in project management skills and techniques needed to manage projects in a modern business environment. Prerequisite: MANGT 300, MANGT 310
MANGT 420 CONFLICT MANAGEMENT (3) An exploration of the sources of interpersonal conflict and strategies of resolution in the managerial context. Prerequisite: MANGT 300
MANGT 440 ADVANCED HUMAN RESOURCE MANAGEMENT (3) In depth study of human resource management and personnel administration functions and processes. Prerequisite: MANGT 340
MANGT 442 (GI) MANAGING DIVERSITY (3) Historical and economic review of women's and minorities' participation in United States workforce and analysis of contemporary organizational diversity cases. Prerequisite: SPCOM 100; MANGT 300, PSY 002, or WMNST 001; sixth-semester standing
MANGT 450 OPERATIONS PLANNING AND CONTROL (3) Aggregate production planning procedures, disaggregation methods in hierarchical production planning, master production scheduling, material requirements planning, lot-sizing, and capacity planning. Prerequisite: MANGT 310
MANGT 455 LOGISTICS SYSTEMS ANALYSIS AND DESIGN (3) Customer service, inventory management, transportation, warehousing, purchasing, international logistics, site location planning and analysis, and total cost analysis. Prerequisite: MANGT 310
MANGT 460 PURCHASING AND MATERIALS MANAGEMENT (3) Purchasing policies, procedures, order specifications and agreements, supplier selection, and the role of purchasing in production planning and inventory management. Prerequisite: MANGT 310
MANGT 470W STRATEGIC MANAGEMENT AND BUSINESS POLICY (3) Study of strategic management and business policy formulation and implementation processes. Prerequisite: FNC 300, MANGT 300, MANGT 310, MRKTG 300, and seventh-semester standing
MANGT 480 (GI) INTERNATIONAL MANAGEMENT (3) Explores international and multi-cultural work environments, examining cultural assumptions and universal applicability of management theories and practices. Prerequisite: MANGT 300
MANGT 494 RESEARCH PROJECT (1–12)
MANGT 495 INTERNSHIP (1–18)
MANGT 496 INDEPENDENT STUDIES (1–18)
MANGT 497 SPECIAL TOPICS (1–9)

MANAGEMENT (MGMT)

Smeal College of Business

MGMT 001S BUSINESS LEADERSHIP (3) The aim of this course is to introduce fundamental concepts of business management and leadership.
MGMT 100 SURVEY OF MANAGEMENT (3) Introduction to organizational factors relevant to management processes, including leadership, motivation, job design, technology, organizational design and environments, systems, change. May not be used to satisfy Smeal College baccalaureate degree requirements. Not available to students who have taken B A 304 or MGMT 301.
MGMT 100W SURVEY OF MANAGEMENT (3) Introduction to organizational factors relevant to management processes, including leadership, motivation, job design, technology, organizational design and environments, systems, change. May not be used to satisfy Smeal College baccalaureate degree requirements. Not available to students who have taken B A 304 or MGMT 301.
MGMT 150 SUPERVISORY MANAGEMENT (3) Preparation for supervisory positions in formal organizations. Emphasis placed on the motivational aspects of the supervisor's job. Prerequisite: MGMT 100
MGMT 296 INDEPENDENT STUDIES (1–18)
MGMT 297 SPECIAL TOPICS (1–9)
MGMT 301 BASIC MANAGEMENT CONCEPTS (3) Study of fundamental principles and processes applicable to the understanding of management. May not be used to satisfy Smeal College baccalaureate degree requirements. Not available to students who have taken B A 304 or MGMT 100. Prerequisite: ENGL 015, MATH 021; ECON 002 or ECON 004
MGMT 301W BASIC MANAGEMENT CONCEPTS (3) Examination of fundamental principles and processes applicable to the study of managment. Prerequisite: ENGL 015; MATH 021; ECON 002 or ECON 004

MGMT 321 LEADERSHIP AND MOTIVATION (3) Applies organizational behavior theories, concepts, and skills to leading and motivating individuals and groups. Prerequisite: B A 304, MGMT 100, or MGMT 301; or 3 credits of psychology, sociology, or cultural anthropology
MGMT 326 ORGANIZATIONAL BEHAVIOR AND DESIGN (3) Concepts, theories, and methods of managing people and designing organizations. Prerequisite: B A 304
MGMT 331 MANAGEMENT AND ORGANIZATION (3) Designing organizations to effectively manage new technologies, structures, and people in changing global contexts. Prerequisite: B A 304, MGMT 100, or MGMT 301; or 3 credits of psychology, sociology, or cultural anthropology
MGMT 341 HUMAN RESOURCE MANAGEMENT (3) Introduction to the strategic planning and implementation of human resource management, including staffing, development, appraisal, and rewards. Prerequisite: B A 304, MGMT 100, or MGMT 301
MGMT 395 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
MGMT 397 SPECIAL TOPICS (1–9)
MGMT 398 SPECIAL TOPICS (1–9)
MGMT 401 CONTEMPORARY ISSUES IN MANAGEMENT (3) Advanced treatment of topics of current managerial significance. Issues examined will differ by instructor, section, and semester. Consult departmental office. Prerequisite: MGMT 321, MGMT 331
MGMT 424 INTERPERSONAL RELATIONSHIPS IN ORGANIZATIONS (3) Developing individual skills in interpersonal and group settings and experience-based and conceptual training in relating effectively to other people. Prerequisite: MGMT 321
MGMT 441 HRM PROFESSIONAL SEMINAR (PART 1): STAFFING AND DEVELOPMENT (3) This course focuses on the skills and methods managers need to manage staffing and development activities in organizations. Prerequisite: MGMT 341 Concurrent: MGMT 442
MGMT 442 HRM PRACTICUM (PART ONE): STAFFING AND DEVELOPMENT (1.5) This course focuses on students applying the skills and techniques of staffing and development in an applied setting. Prerequisite: MGMT 341 Concurrent: MGMT 441
MGMT 443 HRM PROFESSIONAL SEMINAR (PART 2): PERFORMANCE MANAGEMENT (3) This course focuses on skills and methods managers need to enhance the contribution of employees to organizational performance and effectiveness. Prerequisite: MGMT 341 Concurrent: MGMT 444
MGMT 444 HRM PRACTICUM (PART TWO): PERFORMANCE MANAGEMENT (1.5) This course focuses on students applying the skills and techniques of performance management in an applied setting. Prerequisite: MGMT 341 Concurrent: MGMT 443
MGMT 445 (GI) MANAGING DIFFERENCES IN ORGANIZATIONS (3) This course focuses on developing knowledge and skills for dealing with demographic, functional, occupational and identity-based differences within and among organizations. Prerequisite: B A 304, MGMT 341
MGMT 451W BUSINESS, ETHICS, AND SOCIETY (3) Advanced examination of social, ethical, legal, economic, equity, environmental, public policy, and political influences on managerial decisions and strategies. Prerequisite: B A 241 and B A 242 or B A 243
MGMT 461 INTERNATIONAL MANAGEMENT (3) Examines issues of nations and cultures including motivation, communication, negotiation, leadership, ethics and social responsibility, and women in management. Prerequisite: B A 301, B A 302, B A 303, B A 304
MGMT 471 STRATEGIC MANAGEMENT (3) Issues that influence the competitive performance of the firm are identified and examined. Prerequisite: MGMT 326, B A 411 or taken concurrently
MGMT 496 INDEPENDENT STUDIES (1–18)
MGMT 497 SPECIAL TOPICS (1–9)

MANAGEMENT (MNGMT)

Capital College

MNGMT 310 ORGANIZATIONS: STRUCTURE AND PROCESS (3) Concepts and applications of organizational theory, behavior, and interpersonal communications.
MNGMT 397 SPECIAL TOPICS (1–9)
MNGMT 441 ORGANIZATION DEVELOPMENT (3) A study of organizational change and methodologies related with change and improvement. Examination of planned change on processes, strategies, people and culture in organizations. Prerequisite: MNGMT 310
MNGMT 442 EXPERIENCES IN ORGANIZATIONAL RELATIONS (3) An experiential approach to study of behavior in organizations, applying concepts and theories of management to interpersonal situations. Prerequisite: MNGMT 310
MNGMT 450 LABOR MANAGEMENT RELATIONS (3) Study of the key concepts and processes involved in current American labor/management relations. Prerequisite: MNGMT 310
MNGMT 451 ENTREPRENEURSHIP AND SMALL BUSINESS MANAGEMENT (3) Entrepreneurship, new ventures, and management of small firms. Prerequisite: ACCTG 211, MNGMT 310, MRKT 370
MNGMT 452 SMALL BUSINESS FIELD STUDY (3) Supervised field study with a small firm. Prerequisite: MNGMT 451 and permission of program
MNGMT 460 PRODUCTION PLANNING AND CONTROL (3) Survey of manufacturing methods and management techniques for operating production systems. Prerequisite: BUS 361

MNGMT 461 INTERNATIONAL AND COMPARATIVE MANAGEMENT (3) Management practices and corporate strategy in the international context: trade, foreign direct investment and comparisons with American practices. Prerequisite: MNGMT 310
MNGMT 463 HUMAN RESOURCES MANGEMENT (3) Examination of management practices, selection and placement, training and development, compensation and benefits, labor relations, and employee health and safety. Prerequisite: MNGMT 310
MNGMT 480 ORGANIZATIONAL THEORY (3) Analysis of the structure and function of complex organizations as they impact members and organization effectiveness. Prerequisite: MNGMT 310
MNGMT 489 SEMINAR IN MANAGEMENT (3) A capstone course in management for students of high academic achievement. Emphasis on in-depth research of current interest. Prerequisite: MNGMT 310 and at least senior status
MNGMT 491 MANAGEMENT INFORMATION SYSTEMS (3) Design and implementation of information systems directed at aiding decision making in organizations. Prerequisite: admission to MBA program
MNGMT 494 RESEARCH PROJECT (1–12)
MNGMT 495 INTERNSHIP (1–18)
MNGMT 496 INDEPENDENT STUDIES (1–18)
MNGMT 497 SPECIAL TOPICS (1–9)

MANAGEMENT INFORMATION SYSTEMS (M I S)

Smeal College of Business

M I S 101 MICROCOMPUTER PROGRAMMING IN STRUCTURED BASIC (3) Introduction to the microcomputer algorithmic process, using BASIC as the vehicle to construct computer solutions to common problems.
M I S 103 MICROCOMPUTER APPLICATIONS IN BUSINESS (3) Introduction to current business uses of the microcomputer, including spreadsheets, database management, word processing, and decision-making models.
M I S 104 ADVANCED MICROCOMPUTER APPLICATIONS IN BUSINESS (3) Introduction to current business uses of the microcomputer in the following areas: graphics, visual presentation, hypertext, and multimedia technology. Prerequisite: M I S 103
M I S 106 SPECIALIZED MICROCOMPUTER APPLICATIONS IN BUSINESS (1–6) Use of the microcomputer in the functional areas of business (e.g., accounting, management, marketing, finance, etc.). Prerequisite: 3 credits in a business administration appropriate functional area; prior written approval of department
M I S 109 MICROCOMPUTER APPLICATIONS IN BUSINESS STATISTICS (1) Use of the microcomputer in the functional areas of business statistics.
M I S 110 INTRODUCTION TO COBOL (3) Fundamentals of structured COBOL programming. Prerequisite: M I S 204
M I S 120 MICROCOMPUTER OPERATING SYSTEMS AND USER INTERFACES (3) Management of microcomputer hardware and software, including systems software, user interfaces, file management, security features, and applica- tions software installation. Prerequisite: M I S 103
M I S 130 ADVANCED DATABASE MANAGEMENT SYSTEMS FOR MICROCOMPUTERS (3) Advanced relational database design, data integrity, data security, operational procedures, business applications using microcomputer database software. Prerequisite: M I S 103
M I S 180 NETWORKING AND TELECOMMUNICATIONS FOR BUSINESS (3) Presentation of the technology and architecture of local area networks and telecommunications from a business perspective.
M I S 190 MICROCOMPUTER ACCOUNTING AND TRANSACTION PROCESSING (3) Use of accounting software to manage small to medium sized businesses, transaction processing, general ledger, payables, receivables, inventory management, payroll. Prerequisite: CMPSC 203 or M I S 103. Prerequisite or concurrent: 2 credits in Financial Accounting
M I S 204 INTRODUCTION TO BUSINESS INFORMATION SYSTEMS (2) Introduction to the use of information systems in business organizations.
M I S 296 INDEPENDENT STUDIES (1–18)
M I S 297 SPECIAL TOPICS (1–9)
M I S 301 INTRODUCTION TO BUSINESS APPLICATIONS DEVELOPMENT (3) Event-driven programming in a visual environment in which students will learn how to build business applications using current, state of the art technology. Prerequisite: MS&IS 200, CMPSC 101 or CMPSC 203; M I S 204
M I S 302 INTERNET TECHNOLOGY FOR ELECTRONIC COMMERCE (3) Explore methods to utilize Internet technology to facilitate electronic commerce for the public, private, and the not-for-profit entity. Prerequisite: M I S 204 or M I S 301
M I S 397 SPECIAL TOPICS (1–9)
M I S 398 SPECIAL TOPICS (1–9)
M I S 431 BUSINESS DATA MANAGEMENT (3) The architecture of business information processing systems and technical aspects of database management. Prerequisite: CMPSC 101 or CMPSC 203; M I S 204
M I S 432 INFORMATION SYSTEMS ANALYSIS, DESIGN, AND IMPLEMENTATION (3) The analysis, design, and development of business information systems through traditional and modern methods. Prerequisite: M I S 431

M I S 434 INTERNET TECHNOLOGIES (3) Technical foundations of the eBusiness environment and web applications development to support internet-based commerce. Prerequisite: M I S 301 and M I S 431
M I S 436 BUSINESS DATA COMMUNICATIONS (3) Introduction to the principles and techniques of business data communication encompassing transmission concepts, network analysis, design, implementation, and administration. Prerequisite: M I S 431
M I S 436L BUSINESS DATA COMMUNICATIONS (3) Introduction to the principles and techniques of business data communication encompassing transmission concepts, network analysis, design, implementation, and administration. Prerequisite: M I S 431
M I S 436P BUSINESS DATA COMMUNICATIONS Introduction to the principles and techniques of business data communication encompassing transmission concepts, network analysis, design, implementation, and administration. Prerequisite: M I S 431
M I S 442 OBJECT ORIENTED BUSINESS SYSTEMS (3) Object-oriented concepts such as: object, instance, class, inheritance, polymorphism; application of these methodologies and design patterns to business system analysis. Prerequisite: M I S 431
M I S 445 SYSTEMS ADMINISTRATION (3) Use of the UNIX operating system to monitor users and security of networked computer systems. Prerequisite: M I S 431
M I S 479W (OISM) MANAGEMENT OF OPERATIONS INFORMATION/ERP (3) Management and implementation of enterprise information systems for business integration and supply chain management. Prerequisite: M I S 431 Concurrent: M I S 432
M I S 494 RESEARCH PROJECT (1–12)
M I S 496 INDEPENDENT STUDIES (1–18)
M I S 497 SPECIAL TOPICS (1–9)
M I S 498 SPECIAL TOPICS (1–9)

MANAGEMENT INFORMATION SYSTEMS (MISBD)

Penn State Erie, The Behrend College
MISBD 097, 197, 297, 397, 497 SPECIAL TOPICS (1–9)
MISBD 294, 494 RESEARCH PROJECT (1–12)
MISBD 296, 496 INDEPENDENT STUDIES (1–18)
MISBD 321 INTRODUCTION TO MANAGEMENT INFORMATION SYSTEMS (3) An introduction to management information systems in organizations. Prerequisite: CMPBD 100 OR CMPSC 101
MISBD 336 DATABASE MANAGEMENT SYSTEMS (3) Theory and utilization of database management systems in organizations, including data modeling and applications development. Prerequisite: M I S 204
MISBD 430 SYSTEMS ANALYSIS (3) Information analysis and the logical specification of the system. Prerequisite: M I S 204. Prerequisite or concurrent: MISBD 336
MISBD 435 SYSTEMS DESIGN AND IMPLEMENTATION (3) Logical and physical design of information systems and implementation. Prerequisite: MISBD 430; and either CMPBD 204, CMPBD 217, CSE 103, or one full semester of a programming language
MISBD 440 EXPERT SYSTEMS (3) Introduction to expert systems technology; course covers expert system concepts, techniques, development, and management. Prerequisite: MISBD 336; CMPBD 204, CMPBD 217, or CSE 103
MISBD 445 MANAGEMENT REPORTING SYSTEMS (3) Develops insights and skills required to analyze current management reporting systems, propose improvements, and develop reports using a report generator. Prerequisite: MISBD 336
MISBD 470 ADVANCED APPLICATIONS DEVELOPMENT (3) Focus on concepts and practice of advanced tools and techniques such as application generators, object-oriented methods, and client/server development. Prerequisite: MISBD 435
MISBD 495 INTERNSHIP (1–18)

MANAGEMENT SCIENCE AND INFORMATION SYSTEMS (MS&IS)

Smeal College of Business
MS&IS 200 INTRODUCTION TO STATISTICS FOR BUSINESS (4) Introduction to business statistics including topics in probability theory, sampling, inference, quality assurance, regression, forecasting, and simulation. Prerequisite: MATH 018, MATH 110, or MATH 140
MS&IS 296 INDEPENDENT STUDIES (1–18)
MS&IS 297 SPECIAL TOPICS (1–9)
MS&IS 391 INTRODUCTION TO MANAGEMENT SCIENCE AND INFORMATION SYSTEMS (2) Introduction to the quantitative solution of business problems in modern decision support systems. Prerequisite: M I S 204, MS&IS 200
MS&IS 401W (OISM) STATISTICS AND QUALITY CONTROL (3) Statistical methods for measurement and improvement of quality; topics include statistical inference, process control, and design. Prerequisite: MS&IS 200
MS&IS 402 REGRESSION ANALYSIS AND BUSINESS FORECASTING (3) The development and use of regression and time series models for business and economic analysis. Prerequisite: MATH 111 or MATH 141; MS&IS 200

MS&IS 404 SAMPLING IN BUSINESS OPERATIONS AND RESEARCH (3) Applications of sampling methods for business research purposes and for obtaining information necessary to the solution of business problems. Prerequisite: MS&IS 200
MS&IS 427 MANAGEMENT DECISION THEORY (3) Theoretical concepts for the solution of complex decision problems in business. Prerequisite: MS&IS 200
MS&IS 450 OPTIMIZATION METHODS FOR BUSINESS DECISIONS (3) Decision analytic approaches to problem solving under conditions of certainty and uncertainty including linear programming and decision analysis. Prerequisite: MATH 111 or MATH 141; MS&IS 200
MS&IS 452 NONLINEAR PROGRAMMING (3) Identification, formulation, and solution of nonlinear programming problems in business. Prerequisite: MS&IS 450
MS&IS 455 (OISM) RISK ANALYSIS OF BUSINESS SYSTEMS (3) Construction and solution of Monte Carlo simulation models and probabilistic models with application to management planning, control systems, and decision making. Prerequisite: MS&IS 200
MS&IS 456 SIMULATION MODELS OF BUSINESS PROCESSES (3) Business processes are modeled as a network of queues using discrete-event simulation and analyzed model outcomes using statistical methods. Prerequisite: MS&IS 200
MS&IS 459W DECISION SUPPORT SYSTEMS (3) Development of computer-based decision aids for supporting managerial decision making. Prerequisite: M I S 431, MS&IS 402, MS&IS 450; MS&IS 427 or MS&IS 455 or MS&IS 456
MS&IS 461 PROBABILISTIC MODELS IN BUSINESS (3) Construction and solution of probabilistic models in business problems. Prerequisite: MATH 111 or MATH 141
MS&IS 465 MANAGERIAL FORECASTING (3) The use of time series models for business and economic forecasting. Topics include exponential smoothing and Box-Jenkins (ARIMA) models.
MS&IS 494 RESEARCH PROJECT (1–12)
MS&IS 496 INDEPENDENT STUDIES (1–18)
MS&IS 497 SPECIAL TOPICS (1–9)

MANUFACTURING TECHNOLOGY (MFTBD)

Penn State Erie, The Behrend College

MFTBD 060 INTRODUCTION TO PLASTICS TECHNOLOGY (3) Introduction to the nature of plastics and polymers, concepts of molecules, molecular weight, molecular shape and stoichiometry, transitions and viscosity. Concurrent: MATH 021 or MATH 081
MFTBD 061 PLASTICS PROCESSING EQUIPMENT AND OPERATION (4) Mechanical, hydraulic/pneumatic, and electrical aspects of plastic processing equipment are discussed. Prerequisite: MFTBD 060
MFTBD 061W PLASTICS PROCESSING EQUIPMENT AND OPERATION (4) Mechanical, hydraulic/pneumatic, and electrical aspects of plastic processing equipment are discussed. Prerequisite: MFTBD 060
MFTBD 062 TOOLING AND PART DESIGN PRINCIPLES (3) Introduction to the relationship between part design and processing techniques. Prerequisite: or concurrent: MFTBD 061
MFTBD 161 INJECTION MOLDING PROCESSING (3) Fundamentals of the injection molding process and the complex interaction of the components on the product produced. Prerequisite: IE T 109, MFTBD 061, MFTBD 062
MFTBD 162 INJECTION MOLDING PROCESS OPTIMIZATION (3) Advanced issues in injection molding processing, such as use of design of experiments and SPC/SQC to monitor production. Prerequisite: MFTBD 161
MFTBD 167 EXTRUSION PROCESSES (3) The mechanical aspects of the extruder, melt processing, and process optimization. Prerequisite: MFTBD 061
MFTBD 168 ALTERNATE PLASTIC PROCESSES (3) Special processes to manufacture plastic products. Prerequisite: MFTBD 061

MANUFACTURING/ENGINEERING TECHNOLOGY (MFET)

College of Engineering

MFET 202 HYDRAULICS AND PNEUMATICS (3) Introduction to principles of hydraulic and pneumatic systems as applied to practical problems with emphasis on operation, assembly, and checking. Prerequisite: MCH T 111, PHYS 150
MFET 205 GEOMETRIC DIMENSIONING AND TOLERANCES (3) Introduction to principles of methods of geometric dimensioning and tolerances used in technical graphics. Prerequisite: EG T 114
MFET 206 TOOLING AND PART DESIGN PRINCIPLES (2–3 per semester) Introduction to relationship between tooling and part design and processing techniques. Prerequisite: EG T 101, EG T 102, MCH T 111
MFET 210W PRODUCT DESIGN FOR MANUFACTURING (3) Design of mechanical parts and assemblies for manufacturing with writing skills. Prerequisite: MCH T 213, IE T 101, EG T 114

MARINE CORPS COURSES

See **NAVAL SCIENCE**

MARINE SCIENCES (MARSC)

Intercollege

Courses offered in Marine Sciences by Penn State are identified in the Intercollege Undergraduate Programs portion of the Baccalaureate Programs section and are listed under the course offerings of the sponsoring departments.

In addition to Penn State courses, Marine Science courses are offered by the Marine Science Consortium, Inc., during the summer semester at the field station, Wallops Island, VA. A Penn State student may enroll in these courses and, with the approval of the student's major department, have the credits earned transferred to Penn State for the fulfillment of graduation requirements. The courses listed below are offered by the Marine Science Consortium. Information on how to enroll in them or about the consortium program can be obtained from the Penn State Director, Marine Science Consortium, The Pennsylvania State University, 207 Old Main, University Park, PA 16802

INTRODUCTION TO OCEANOGRAPHY (3) Introduction to physical, chemical, biological, and geological aspects of the oceans; emphasis placed on lab and at-sea assignments.

FIELD METHODS IN OCEANOGRAPHY (3) Instruction in the use of application of standard oceanographic instruments and sampling devices used on board small research vessels. Prerequisites: Introduction to Oceanography.

INVERTEBRATE ZOOLOGY (3) Study of the invertebrate phyla, with emphasis on development, reproduction, structure, function, and classification of selected marine organisms. Prerequisites: one year of biology.

MARINE BIOLOGY (3) Morphologic and ecologic study of marine biota, with emphasis on environmental factors affecting biota in littoral and shallow sublittoral habitats. Prerequisite: one year of biology.

MARINE ECOLOGY (3) Ecologic relationships of plants and animals to physical, chemical, and biological factors and their zonation communities. Prerequisite: one year of biology.

FIELD BIOLOGY (3) Introduction to principles of ecology and natural history of plants and animals in terrestrial, freshwater, and marine environments.

CHEMICAL OCEANOGRAPHY (3) Study of salinity, pH, trace elements, geochemical cycles, silica and carbonate chemistry, stable isotopes, and marine authigenesis and diagenesis. Prerequisites: Introduction to Oceanography; one year of chemistry.

MARINE BOTANY (3) Study of marine and marine fringe plants of the Middle Atlantic Coast; their taxonomy, ecology, distribution, life histories, and physiology. Prerequisite: one course in botany or general biology.

ICHTHYOLOGY (3) Anatomy, physiology, and systematics of the fishes from the eastern seaboard; relationships of fishes to their biotic and physical environment. Prerequisite: general biology or zoology.

ANATOMY OF MARINE CHORDATES (3) Study of the basic and specialized structure of marine chordates; qualitative aspects of their speciation process and important evolutionary trends. Prerequisite: one year of biology.

ORNITHOLOGY (3) Avian fauna of the seacoast and comparison with inland species; visual and vocal identification; distribution, behavior, physiology, and anatomy. Prerequisite: one year of biology.

MARINE GEOLOGY (3) Study of the structure and sedimentary environments of the continental shelf, slopes, and ocean basins. Prerequisites: Introduction to Oceanography; physical geology.

PHYSICAL OCEANOGRAPHY (3) Physical properties; mass and energy budgets; theory of distribution of variables; measurement, analysis, and prediction of tides, currents, and waves. Prerequisite: general physical science background.

MARINE MICROPALEONTOLOGY (3) Modern representatives of microorganisms important in the fossil record; emphasis on taxonomy, morphology, evolution, and ecologic affinities of foraminifers (Sarcodina). Prerequisite: one year of geology or biology.

MARINE GEOPHYSICS (3) Application of geophysical theories about transmission of shock waves, gravity, and magnetic fields to understanding and exploration of suboceanic structures. Prerequisites: Introduction to Oceanography; physical geology; one year of mathematics.

MARKETING (MKTG)

Smeal College of Business

*MKTG 150 PROMOTION MANAGEMENT (3) The application and management of various forms of persuasive communication with potential customers: advertising, publicity, personal selling, sales promotion. Prerequisite: MKTG 221

*MKTG 160 PRINCIPLES OF RETAILING (3) Introduction to the management of retailing organizations with emphasis on decision making. Prerequisite: MKTG 221

*MKTG 180 PRINCIPLES OF BUSINESS MARKETING (3) Introduction to the management of business-to-business marketing strategy. Emphasizes strategic response to business marketing opportunities and response to competition. Prerequisite: MKTG 221

*MKTG 190 INTRODUCTION TO MARKETING RESEARCH (3) Practical aspects of marketing research, with emphasis on details of operating a small-scale project. Prerequisite: MKTG 221, MS&IS 200

MKTG 220 PERSONAL SELLING (3) Principles underlying the sales process and practical application of these principles to selling situations. Studies role of selling in total marketing process. Prerequisite: third-semester standing

MKTG 221 CONTEMPORARY AMERICAN MARKETING (3) Social and economic aspects, movement of goods and services from producers to consumers; analysis of marketing functions, systems, and institutions. A student may not receive credit toward graduation for both MKTG 221 and 301, or for both B A 303 and MKTG 221. May not be used to satisfy Smeal College baccalaureate degree requirements. Prerequisite: 3 credits in economics

MKTG 221W CONTEMPORARY AMERICAN MARKETING (3) Social and economic aspects; movement of goods and services from producers to consumers; analysis of marketing functions, systems, and institutions. A student may not receive credit toward graduation for both MKTG 221 and 301, or for both B A 303 and MKTG 221. May not be used to satisfy Smeal College baccalaureate degree requirements. Prerequisite: 3 CREDITS IN ECONOMICS

MKTG 296 INDEPENDENT STUDIES (1–18)

MKTG 297 SPECIAL TOPICS (1–9)

MKTG 301 PRINCIPLES OF MARKETING (3) Focuses on customer behavior, product, channels of distribution, promotion, and pricing with emphasis on a culturally diverse environment. Not available to students who have taken BA 303 or MKTG 221 (or MKTG 221W for 301W). Prerequisite: ENGL 015, MATH 021; ECON 002 or ECON 004

MKTG 301W PRINCIPLES OF MARKETING (3) Focuses on customer behavior, product, channels of distribution, promotion, and pricing with emphasis on a culturally diverse environment. Not available to students who have taken BA 303 or MKTG 221 (or MKTG 221W for 301W). Prerequisite: ENGL 015, MATH 021; ECON 002 or ECON 004

MKTG 302 MARKETING TECHNIQUES FOR ELECTRONIC COMMERCE (3) Explores methods to implement/adapt marketing methods to the Internet; builds upon introductory marketing classes to examine what does/doesn't work. Prerequisite: B A 303 or MKTG 221 or MKTG 301

MKTG 310 PUBLIC RELATIONS AND MARKETING (3) Examination of the role of public relations in a company's efforts to manufacture and market its products and services. Prerequisite: B A 303 or MKTG 221

MKTG 327 RETAILING (3) Management of marketing institutions in distribution channels from producers to consumers. Emphasis on retail institutions: location, personnel, merchandising, control, promotion. Prerequisite: B A 303 or MKTG 221

MKTG 330 BUYER BEHAVIOR (3) Application of behavioral science concepts to the understanding of buyer behavior as a basis for marketing management decision making. Prerequisite: B A 303 or MKTG 221

MKTG 342 MARKETING RESEARCH (3) Research approaches, methods, and applications studied as a formal approach to problem solving for marketing decisions. Prerequisite: B A 303 or MKTG 221

MKTG 397, 398 SPECIAL TOPICS (1–9)

MKTG 416 ELECTRONIC MARKETING (3) Examination of e-marketing from business strategy perspective. Prerequisite: MKTG 330, MKTG 342

MKTG 420 DIRECT MARKETING (3) Applies principles of marketing management to the direct marketing of products by mail, telephone, print, and broadcast media. Prerequisite: MKTG 330, MKTG 342

MKTG 422 ADVERTISING AND SALES PROMOTION MANAGEMENT (3) Perspectives and models of the key decisions involved in managing advertising and sales promotion campaigns. Prerequisite: MKTG 342

MKTG 426 BUSINESS MARKETING (3) Developing marketing strategies and programs. The course emphasizes the special nature of the business and organizational markets. Prerequisite: MKTG 330, MKTG 342

MKTG 428 SALES MANAGEMENT (3) Approaches to planning, organizing, staffing, training, directing, and controlling the sales force in support of marketing objectives. Prerequisite: MKTG 330, MKTG 342

MKTG 435 MARKETING AND SOCIETY (3) Analysis of marketing's impact on and obligation to social and environmental issues, marketing and ethics, and the regulation of marketing. Prerequisite: MKTG 330, MKTG 342

MKTG 437 ADVANCED RETAILING AND MERCHANDISE MANAGEMENT (3) Analyzing planning and controlling the retail merchandising effort, including procurement, resource selection, vendor relations, product presentation, inventory control. Prerequisite: MKTG 330, MKTG 342

MKTG 440 SERVICES MARKETING (3) Marketing theory and methods applied to profit and nonprofit service industries such as health care, finance, transportation, tourism, arts and consulting. Prerequisite: MKTG 330, MKTG 342

MKTG 445 (GI) (I B) GLOBAL MARKETING (3) Role of international marketing in the global environment; political, economic, geographic, historical, cultural conditions; developing and implementing international marketing strategies. Prerequisite: B A 303 or MKTG 221

MKTG 450W MARKETING MANAGEMENT POLICIES AND PROGRAMS (3) Market-oriented problems of the firm; identification and selection of market opportunities; formulation of competitive strategies; marketing policies and programs. Prerequisite: MKTG 330, MKTG 342

MKTG 494 RESEARCH PROJECT (1–12)

MKTG 496 INDEPENDENT STUDIES (1–18)

MKTG 497, 498 SPECIAL TOPICS (1–9)

*Smeal College of Business course numbered 150 to 199 are not acceptable for the B.S. degree in Business at the University Park program.

MARKETING (MRKT)

Capital College

MRKT 370 MARKETING PRINCIPLES (3) Marketing problems of the firm; markets and customer behavior; product; channels of distribution; promotion; and pricing. Prerequisite: ECON 002

MRKT 381 TRANSPORTATION (3) Managerial problems of transport companies; traffic management regulation and public policy Prerequisite: MRKT 370

MRKT 397 SPECIAL TOPICS (1–9)

MRKT 471 MARKETING MANAGEMENT (3) Market-oriented problems of the firm; identification and selection of market opportunities; formulation of competitive strategies; marketing policies and programs. Prerequisite: 3 credits beyond MRKT 370

MRKT 472 MARKETING RESEARCH (3) Research in the marketing decision-making process. Scientific method, problem delineation, research design, data collection techniques, product development. Prerequisite: MRKT 370

MRKT 473 ADVERTISING MANAGEMENT (3) A promotional tool in marketing, creative elements, media, effectiveness, integration within the marketing plan, quantitative approaches, agency organization, and management. Prerequisite: MRKT 370

MRKT 474 RETAILING (3) Analysis of retail institutions with regard to market structure, merchandise selection, locational considerations, competitive factors, and marketing strategy. Prerequisite: MRKT 370

MRKT 475 CONSUMER BEHAVIOR (3) Theories of buyer behavior and research findings as they apply to the sales effort. Prerequisite: MNGMT 310, MRKT 370

MRKT 476 SALES MANAGEMENT (3) Application of modern management principles to field sales force planning, organization, and administration; selection, training, and compensation plans. Prerequisite: MRKT 370

MRKT 477 INTERNATIONAL MARKETING (3) Study of the scope, differences, and opportunities in international marketing; importing and exporting procedures; techniques for trading and investing abroad. Prerequisite: MRKT 370

MRKT 478 SERVICES MARKETING (3) Conceptual understanding of services and the analytical tools that are used in solving strategic services marketing problems. Prerequisite: MRKT 370

MRKT 480 BUSINESS LOGISTICS (3) Physical distribution function in business; role played by transportation, warehousing, location, inventory control; concept of a business logistics system. Prerequisite: MRKT 370

MRKT 485 BUSINESS-TO-BUSINESS MARKETING (3) Application of marketing principles to commercial enterprises, industrial firms, government, and other non-profit institutions. Prerequisite: MRKT 370

MRKT 488 ONLINE MARKETING (3) Concepts of electronic marketing such as online Web Sites that are being integrated into traditional marketing mix concepts. Prerequisite: INFSY 390, MRKT 370

MRKT 489 SEMINAR IN MARKETING (3) Application of new trends and concepts of marketing in problem solving and business decisions. Prerequisite: MRKT 471, senior status

MRKT 494 RESEARCH PROJECT (1–12)

MRKT 495 INTERNSHIP (1–18)

MRKT 496 INDEPENDENT STUDIES (1–18)

MRKT 497 SPECIAL TOPICS (1–9)

MARKETING (MRKTG)

Penn State Erie, The Behrend College

MRKTG 300 PRINCIPLES OF MARKETING (3) Marketing decisions involving the marketing mix in the context of behavioral, cultural, demographic, ethical, and global issues. Prerequisite: fifth-semester standing

MRKTG 310 MARKETING RESEARCH (3) Research approaches, analytical methods, and applications studied as a formal approach to problem solving and aiding marketing decisions. Prerequisite: MS&IS 200

MRKTG 320 CONSUMER BEHAVIOR (3) Application of behavioral science concepts to the understanding of buyer behavior as a basis for marketing management decision making. Prerequisite: MRKTG 300, MRKTG 310

MRKTG 330 SERVICES MARKETING (3) Marketing theory and methods applied to profit and nonprofit organizations that offer services or intangible products. Prerequisite: MRKTG 300, MRKTG 310

MRKTG 397 SPECIAL TOPICS (1–9)

MRKTG 400 RETAILING (3) Considers the activities and strategies involved in the direct sale of goods or services to the consumer. Prerequisite: MRKTG 300

MRKTG 410 PERSONAL SELLING (3) Principles underlying the selling process and practical application of these principles to selling situations. Prerequisite: MRKTG 300

MRKTG 420 SALES MANAGEMENT (3) Comprehensive and rigorous coverage of contemporary sales management theories and processes and demonstrate their practical application to selling situations. Prerequisite: MANGT 300, MRKTG 300

MRKTG 470 (DF) GLOBAL MARKETING (3) This course will endeavor to develop a global perspective for marketing decision making. Prerequisite: MRKTG 300

MRKTG 494 RESEARCH PROJECT (1–12)

MRKTG 495 INTERNSHIP (1–18)

MRKTG 496 INDEPENDENT STUDIES (1–18)

MRKTG 497 SPECIAL TOPICS (1–9)

MATERIALS ENGINEERING TECHNOLOGY (MAE T)

College of Earth and Mineral Sciences; Commonwealth College

MAE T 201 INTRODUCTION TO MATERIALS ENGINEERING TECHNOLOGY (3) An introduction to Materials Engineering Technology emphasizing relationships between structure and properties of engineering materials. Prerequisite: CHEM 012, MATH 082

MAE T 202 MATERIALS TESTING (3) A review of industrial methods and testing standards used for mechanical property testing and evaluation of engineering materials. Prerequisite: MATH 082, PHYS 150

MAE T 203 INTRODUCTION TO POWDER METALLURGY (3) A comprehensive study of powdered metal technology including production, characterization, compaction, sintering, and finishing operations. Prerequisite: CHEM 012, MATH 082

MAE T 204W STRUCTURE CHARACTERIZATION LABORATORY (3) A hands-on experience course with emphasis on equipment and lab techniques used for microstructural evaluation of metals. Prerequisite: MAE T 201, CHEM 014, PHYS 150

MAE T 205 POWDER METALLURGY LABORATORY (4) A capstone course emphasizing hands-on laboratory experience in powder metallurgy and semester project; field trips to nearby P/M industries. Prerequisite: MAE T 201, MAE T 202, MAE T 203, CHEM 014, MATH 083

MAE T 297 SPECIAL TOPICS (1–9)

MATERIALS ENGINEERING TECHNOLOGY (MAT T)

College of Earth and Mineral Sciences; Commonwealth College

MAT T 200W MATERIALS LABORATORY PRACTICE (3) Introduction to the methods used to prepare microstructures of various materials, measure elevated temperature, and perform physical property tests. Prerequisite: CHEM 014, PHYS 150

MAT T 201 PHYSICAL ANALYSIS OF MATERIALS (3) A study of the structures in several classes of materials, manipulation of these structures, and the behavior of these materials. Prerequisite: CHEM 012, MATH 082

MAT T 202 MATERIALS TESTING (3) Instruction in the methods used for the mechanical property testing of materials including test specimen design, procedures, and the statistical evaluation of data. Prerequisite: MATH 082

MAT T 203 MATERIALS PRODUCTION AND PROCESSING I (3) Analysis of important materials—production from raw sources, processing into usable forms, and their ranges of physical and mechanical properties. Prerequisite: CHEM 012, MAT T 202

MAT T 204 MATERIALS PRODUCTION AND PROCESSING II (3) A study of materials from their production, processing, and property selection aspects with visits to several materials-related plants. Prerequisite: CHEM 012, MAT T 202

MAT T 297 SPECIAL TOPICS (1–9)

NOTE: These courses are deemed to be of sufficient depth that graduates from the MAT T program may pursue studies in most baccalaureate materials-related programs.

MATERIALS SCIENCE (MATSC)

College of Earth and Mineral Sciences

MATSC 101 (GN) (EGEE) ENERGY AND THE ENVIRONMENT (3) Energy utilization and technological development, energy resources, conversion and consequences on the local and global environment, and future energy alternatives.

MATERIALS SCIENCE AND ENGINEERING (MATSE)

College of Earth and Mineral Sciences

MATSE 081 (GN) MATERIALS IN TODAY'S WORLD (3) A survey of the properties, manufacture, and uses of polymers, ceramics and metals in today's world with emphasis on modern developments and new materials.

MATSE 090H HIGH-TECH MATERIALS (1) A series of introductory seminars concerning the most important aspects of modern materials technology; some laboratory visits will be included.

MATSE 201 INTRODUCTION TO MATERIALS SCIENCE (3) Concepts of relationships between structure and thermal, optical, magnetic, electrical, and mechanical properties of metals, ceramics, glasses, and polymers. Prerequisite: CHEM 013; MATH 231

MATSE 259 PROPERTIES AND PROCESSING OF ENGINEERING MATERIALS (3) Relationship of structure and processing variables to the properties and service behavior of metals, polymers, and ceramics. Prerequisite: E MCH 013 OR E MCH 210

MATSE 297 SPECIAL TOPICS (1–9)

MATSE 310W METALLURGICAL LITERATURE AND SEMINARS (2) Designed to familiarize students with literature and current technological developments in the field of metallurgy. Includes a field trip.

MATSE 400 CRYSTAL CHEMISTRY (3) Principles of crystal chemistry applied to structures, structural defects and properties of organic, inorganic, intermetallic, and metallic crystals. Prerequisite: CHEM 013, CHEM 015, MATH 231, MATH 251, PHYS 214

MATSE 401 THERMODYNAMICS OF MATERIALS (3) Review of equilibrium thermodynamics and applications to metallurgical and material systems. Prerequisite: CHEM 013, PHYS 214

MATSE 402 MATERIALS PROCESS KINETICS (3) A treatment of process kinetics including chemical reaction kinetics and momentum, energy and mass transport. Prerequisite: MATH 251, PHYS 214

MATSE 403 BIOMEDICAL MATERIALS (3) Describe properties of materials and composites and their in vivo interactions. Prerequisite: MATSE 201

MATSE 404 SURFACES AND THE BIOLOGICAL RESPONSE TO MATERIALS (3) Focus is on the special properties of surfaces as an important causative and mediating agent in the biological response to materials. Prerequisite: CHEM 014, CHEM 015

MATSE 409 (NUC E) NUCLEAR MATERIALS (3) Nuclear reactor materials: relationship between changes in material properties and microstructural evolution of nuclear cladding and fuel under irradiation. Prerequisite: PHYS 214

MATSE 410 PHASE RELATIONS IN MATERIALS SYSTEMS (3) Phase rule; construction and interpretations of equilibrium diagrams; importance of nonequilibrium in materials. Prerequisite: CHEM 015, MATH 251, PHYS 214 Concurrent: MATSE 201, MATSE 400, MATSE 430

MATSE 411 PROCESSING OF CERAMICS (3) Principles of ceramic processing, including powder preparation and characterization, forming operations, and the basic phenomena underlying these operations. Prerequisite: MATSE 400, MATSE 402, MATSE 466

MATSE 412 THERMAL PROPERTIES AND REFRACTORIES (3) Generation of high temperatures, measurement of temperature, heat transfer and furnace design, thermal stability of ceramic materials, applied thermodynamics. Prerequisite: MATSE 201, MATSE 400, MATSE 401, MATSE 402, MATSE 410, MATSE 413 Concurrent: MATSE 401

MATSE 413 SOLID-STATE MATERIALS (3) Structures of metallic, ionic, and covalent solids, amorphous materials, and surfaces; electronic structure; electronic properties of solids and their manipulation. Prerequisite: or concurrent: MATSE 201

MATSE 414 MECHANICAL PROPERTIES OF CERAMICS (3) This course will give students a fundamental understanding and appreciation for the relationship between the structure and mechanical behavior of ceramic materials. Prerequisite: E MCH 210, MATH 220, MATSE 201, MATSE 400, MATSE 430 Concurrent: MATSE 401

MATSE 415 INTRODUCTION TO GLASS SCIENCE (3) Composition, melting, fabrication, properties, and uses of glass; combinations of glass with metals and other materials. Prerequisite: MATSE 400, MATSE 401, MATSE 402, MATSE 462

MATSE 417 ELECTRICAL AND MAGNETIC PROPERTIES (3) Electrical conductivity, dielectric properties, piezoelectric and ferroelectric phenomena; magnetic properties of ceramics. Prerequisite: MATSE 400, MATSE 402, PHYS 214

MATSE 420 CORROSION AND DEGRADATION OF ENGINEERING MATERIALS (3) General principles and forms of corrosion/degradation, preventative measures and designs which avoid corrosion and environmental degradation, failure analysis. Prerequisite: PHYS 212

MATSE 421 CORROSION ENGINEERING (2–3) Industrial forms of corrosion and preventive methods, and their description in terms of basic thermodynamic and kinetic considerations. Prerequisite: CHEM 013, PHYS 202

MATSE 422 THERMOCHEMICAL PROCESSING (3) Physico-chemical aspects of high temperature extraction and processing of metals and alloys. Design and evaluation of processes and process options. Prerequisite: MATSE 401, MATSE 402

MATSE 423 PHYSICAL MATERIALS (4) An introduction to phase equilibria, phase transformations and microstructural development in materials. Prerequisite: MATSE 430, MATSE 470

MATSE 424 MATERIALS SELECTION AND DESIGN (1) Introduction to the selection and design of materials for structural applications. Prerequisite: MATSE 201 or MATSE 259

MATSE 425 PROCESSING OF METALS (3) Modern methods of shaping metals in liquid and solid states: casting, joining, powder and deformation processing. Design of new technology. Prerequisite: MATSE 402, MATSE 423, MATSE 424

MATSE 426 (MN PR) AQUEOUS PROCESSING (3) A study of the chemical and engineering principles pertinent to metal processing in aqueous systems: hydrometallurgical extraction, plating, materials preparation. Prerequisite: EGEE 301 or MATSE 401

MATSE 427 FERROUS PHYSICAL METALLURGY (3) Phase transformations in, and mechanical properties of ferrous systems; heat treatment principles. Prerequisite: MATSE 423, MATSE 424

MATSE 428 (E SC) ELECTROCHEMICAL METHODS IN CORROSION SCIENCE AND ENGINEERING (3) The objective of the course is to give students hands-on experience in assessing environmental degradation of engineering materials. Prerequisite: E SC 414M or MATSE 259; MATSE 420 or MATSE 421

MATSE 430 MATERIALS CHARACTERIZATION (3) Elements of crystallography and the characterization of crystalline and non- crystalline materials using x-ray diffraction, electron microscopic, and other instrumental techniques. Prerequisite: PHYS 214

MATSE 435 OPTICAL PROPERTIES OF MATERIALS (3) Electromagnetic spectrum, interaction of light with materials, color, thin film optical coatings, electro-, integrated and nonlinear optics. Prerequisite: MATSE 400

MATSE 436 MECHANICAL PROPERTIES OF MATERIALS (3) Fundamental relationships between structure and mechanical behavior of materials. Prerequisite: MATH 231, MATH 250 or MATH 251, PHYS 214, MATSE 201 or MATSE 259 or E SC 314

MATSE 440 (E MCH) NONDESTRUCTIVE EVALUATION OF FLAWS (3) Methods and limitations of nondestructive evaluation of mechanical flaws; optical, acoustical, electromagnetic, x-ray, radiography, thermography, and dye techniques. Prerequisite: E MCH 013 OR E MCH 110H OR E MCH 210

MATSE 441 POLYMERIC MATERIALS I (3) Manufacture of industrially significant polymers together with discussion of their major chemical, physical, and mechanical properties. Prerequisite: CHEM 038, MATH 231, PHYS 214

MATSE 442 POLYMER SYNTHESIS (3) Preparation of commercially useful polymers and their molecular structure characterization.

MATSE 443 INTRODUCTION TO THE MATERIALS SCIENCE OF POLYMERS (3) Introduction to the nature and structure of high polymers. Characteristics of polymers and polymer systems. Prerequisite: CHEM 038, MATH 231, PHYS 214

MATSE 444 SOLID STATE PROPERTIES OF POLYMERIC MATERIALS (3) Structure/property relationships in the bulk solid state of polymers. Characterization of bulk properties and structure. Prerequisite: MATSE 443

MATSE 445 THERMODYNAMICS, MICROSTRUCTURE, AND CHARACTERIZATION OF POLYMERS (3) The properties of individual polymer chains. Theoretical and experimental techniques pertaining to the characterization of polymeric microstructure. Prerequisite: MATSE 443

MATSE 446 MECHANICAL AND ELECTRICAL PROPERTIES OF POLYMERS AND COMPOSITIES (3) The mechanical (viscoelastic) and electric properties of polymers and poly-based composites. Prerequisite: MATSE 443

MATSE 447 RHEOLOGY AND PROCESSING OF POLYMERS (3) This course deals with the fluid mechanics, rheology, and processing of polymeric materials. Prerequisite: MATSE 443

MATSE 448 ADVANCED PROCESSING TECHNOLOGY (3) Basic principles of polymer melt processing are reviewed and subsequently applied to the most important industrial processing operations.

MATSE 450 (E SC) SYNTHESIS AND PROCESSING OF ELECTRONIC AND PHOTONIC MATERIALS (3) The materials science of applying thin film coatings, etching, and bulk crystal growth; includes materials transport, accumulation, epitaxy, and defects. Prerequisite: CHEM 013, MATSE 400, MATSE 401, MATSE 402, PHYS 214

MATSE 455 PROPERTIES AND CHARACTERIZATION OF ELECTRONIC AND PHOTONIC MATERIALS (3) Materials characterization in general; electrical properties of crystals, contacts, films; optical properties of single phase materials, waveguide, and multilayer stacks. Prerequisite: CHEM 013, MATSE 400, PHYS 214

MATSE 460 INTRODUCTORY LABORATORY IN MATERIALS (1) An introduction to comparative physical properties and characteristics of various materials including mechanical, electrical thermal, and structure/ morphology. Prerequisite: or concurrent: MATSE 201

MATSE 461 INTRODUCTION TO ELECTRONIC AND PHOTONIC MATERIALS LABORATORY (1) An introductory lab course to demonstrate important physical, thermal, and electronic properties of materials, as well as, methods of materials characterization. Prerequisite: CHEM 013, PHYS 214 Concurrent: MATSE 400

MATSE 463 CHARACTERIZATION AND PROCESSING OF ELECTRONIC AND PHOTONIC MATERIALS LAB ORATORY (1) Provides experience with key processing methods for EPM materials and advanced characterization methods for EPM materials and simple device structures. Prerequisite: MATSE 400, MATSE 430, MATSE 461 Concurrent: MATSE 450, MATSE 455

MATSE 466 CERAMICS LABORATORY I (.5) Measurement of mechanical propoerties of ceramics, ASTM standards. Prerequisite: MATSE 460 Concurrent: MATSE 436

MATSE 467 CERAMICS LABORATORY II (.5) Preparation of glass; chemical and physical properties of glass. Prerequisite: MATSE 460 Concurrent: MATSE 415

MATSE 468 CERAMICS LABORATORY III (.5–1 per semester) Cermaic processing and powder characteristics. Prerequisite: MATSE 460 Prerequisite or concurrent MATSE 411

MATSE 469 CERAMICS LABORATORY IV (.5–1) Measurement of electrical, magnetic, optical properties of ceramics. Prerequisite: MATSE 460 Prerequisite or concurrent MATSE 417, MATSE 435

MATSE 471 METALLURGY LABORATORY II (1) A laboratory integrating experimental aspects of material contained in MATSE 402, 413, and 423, e.g. phase diagram determination, solidification micro- structures, etc. Prerequisite: MATSE 430

MATSE 472 METALLURGY LABORATORY II (1) Application of principles of mechanical metallurgy, pyroprocessing, corrosion and metal processing. Prerequisite: MATSE 423, MATSE 471 Concurrent: MATSE 421

MATSE 473 POLYMERIC MATERIALS LABORATORY—SYNTHESIS (1) Principles and practices of polymerization, including condensation, free radical (bulk, solution, suspension, emulsion), ionic, and Zeigler-Natta procedures. Prerequisite: MATSE 443

MATSE 474 POLYMERIC MATERIALS LABORATORY—CHARACTERIZATION (1) Principles and practices involved in determination of properties, structure and morphology, employing thermal, mechanical, spectroscopic, viscometric and computer techniques. Prerequisite: MATSE 443

MATSE 475 (E SC) PARTICULATE MATERIALS PROCESSING (3) Fundamentals of processing particulate materials including production, characterization, handling, compaction, and sintering of metal, carbide, intermetallic, and composite powders. Prerequisite: E MCH 215, E SC 414, OR MATSE 259

MATSE 490 CERAMIC SEMINAR AND FIELD TRIP (1) Weekly conferences and reports on recent ceramic developments, preparatory work for MATSE 493W, and visitations to ceramic plants. Prerequisite: MATSE 400, MATSE 410, MATSE 430

MATSE 493W SENIOR RESEARCH PROJECT (1) Individual or group research project under direct supervision of a faculty member.
MATSE 494W RESEARCH AND DESIGN SENIOR PROJECT (2) Continuation of a research problem in materials culminating in a bound thesis describing the work. Prerequisite: MATSE 493W
MATSE 496 INDEPENDENT STUDIES (1–18)
MATSE 497 SPECIAL TOPICS (1–9)

MATHEMATICAL SCIENCES (MA SC)

Capital College
MA SC 370 FOUNDATIONS OF MATHEMATICS (3) A consideration of selected topics in the foundations of mathematics, with emphasis on development of basic meaning and concepts. Prerequisite: CMATH 221 or MATH 141
MA SC 397 SPECIAL TOPICS (1– 9)
MA SC 420 MATHEMATICAL STATISTICS AND APPLICATIONS I (3) Distributions of random variables, special distributions, limiting distributions, sampling, statistical inference, point and interval estimation, orthogonal polynomials, and least squares. Prerequisite: CMATH 221 or MATH 141
MA SC 421 MATHEMATICAL STATISTICS AND APPLICATIONS II (3) Further topics in point estimation, statistical hypotheses, other statistical tests, nonparametric methods. Prerequisite: MA SC 420
MA SC 422 INTRODUCTION TO APPLIED STATISTICS I (3) Descriptive statistics, probability theory, discrete and continuous probability distributions, statistical inferences for means and proportions. Prerequisite: MATH 022 or MATH 040
MA SC 423 INTRODUCTION TO APPLIED STATISTICS II (3) Regression, correlation, analysis of variance, contingency tables, nonparametric methods, time series, index numbers. Prerequisite: MA SC 455
MA SC 424 MATHEMATICAL METHODS IN ENGINEERING (3) Mathematical topics and problem-solving techniques of particular value in engineering and the physical sciences. Prerequisite: CMATH 211 or MATH 141
MA SC 425 INTRODUCTION TO OPERATIONS RESEARCH (3) Nature of operations research, problem formulation, model construction, deriving solution from models, allocation problems, general linear allocation problem, inventory problems. Prerequisite: CMATH 221 or MATH 141
MA SC 427 SAMPLING METHODS AND PRACTICE AND EXPERIMENTAL DESIGN (3) An introduction to the procedures and techniques of statistical sampling methods and experimental design. Prerequisite: MA SC 420, MA SC 421
MA SC 435 COMPOUND INTEREST AND ANNUITIES—CERTAIN (3) A study of compound interest and annuity functions; equations of value; determination of yield rates; construction of tables. Prerequisite: CMATH 221 or MATH 141
MA SC 436 LIFE CONTINGENCIES I (3) A study of the mathematical theory of life contingencies; single-life functions and their applications. Prerequisite: MA SC 420, MA SC 421, MA SC 435
MA SC 440 DIFFERENTIAL EQUATIONS AND CONTINOUS MODELS I (3) Linear differential equations, existence and uniqueness, systems, series solutions, eigenvalue problems, Laplace transforms, partial differential equations, applications to continous models. Prerequisite: CMATH 221 or MATH 141
MA SC 441 DIFFERENTIAL EQUATIONS AND CONTINUOUS MODELS II (4) Linear differential equations, existence and uniqueness, systems, series solutions, eigenvalue problems, Laplace transforms, partial differential equations, applications to continuous models. Prerequisite: CMATH 221 or MATH 141
MA SC 445 EUCLIDEAN GEOMETRY AND TRANSFORMATIONS (3) Elements of modern geometry based on transformation theory. Prerequisite: MA SC 370, MA SC 460
MA SC 450 ADVANCED CALCULUS (3) Differential and integral calculus of functions of several variables, line and surface integrals, infinite series, series of functions, power series. Prerequisite: CMATH 221 or MATH 141
MA SC 455 INTRODUCTION TO REAL ANALYSIS (3) Real number system, metric spaces, real functions, limits, continuity, differential calculus, Riemann integral, sequences and series. Prerequisite: CMATH 221 or MATH 141
MA SC 457 COMPLEX ANALYSIS (3) Introduction to complex function theory, complex numbers, complex functions, analytic functions, complex integration. Prerequisite: MA SC 450
MA SC 460 LINEAR ALGEBRA AND DISCRETE MODELS I (3) Vector spaces, linear transformations, matrices determinants, characteristic values and vectors, systems of linear equations, applications to discrete models. Prerequisite: CMATH 221 or MATH 141
MA SC 461 LINEAR ALGEBRA AND DISCRETE MODELS II (3) Vector spaces, linear transformations, matrices, determinants, characteristic values and vectors, systems of linear equations, applications to discrete models. Prerequisite: MA SC 460
MA SC 465 MODERN ALGEBRA (3) An introduction to the basic theory of groups, rings and fields. Prerequisite: MATH 230
MA SC 475W INTRODUCTION TO THE HISTORY OF MATHEMATICS (3) A global survey of the history of mathematics as viewed as a human response to cultural, political, economic, and societal pressures. Prerequisite: CMATH 221 or MATH 141
MA SC 477 MATHEMATICAL MODELING (3) The construction and utilization of mathematical models for the solution of real-world problems. Prerequisite: MA SC 370, MA SC 460

MA SC 496 INDEPENDENT STUDIES (1–18)
MA SC 497 SPECIAL TOPICS (1– 9)

MATHEMATICS (CMATH)

Capital College

CMATH 220 APPLIED CALCULUS (4) Elements of analytic geometry, techniques and interpretation of differentiation and integration, special functions; emphasis on applications for technologists. Prerequisite: trigonometry, introductory course in calculus, satisfactory grades on Capital College mathematics examination or passing grade in CMATH 219

CMATH 221 APPLIED CALCULUS AND DIFFERENTIAL EQUATIONS (4) Taylor's Theorem, infinite series, function of several variables, partial differentiation, multiple integrals, introduction to ordinary differential equations; emphasis on applications. Prerequisite: CMATH 220

CMATH 222 DIFFERENTIAL EQUATIONS FOR ENGINEERS (2) First-order equations, higher-order linear equations, electrical circuits, series methods. Concurrent: CMATH 221

CMATH 297 SPECIAL TOPICS (1–9)

CMATH 320 LINEAR AND DIFFERENTIAL EQUATIONS FOR ENGINEERING DESIGN (2) Matrix algebra, linear equations, Gaussian elimination, determinants, eigenvalues and eigen vectors, numerical methods for first- and second-order differential equations. Concurrent: CMATH 220 or MATH 140

CMATH 397 SPECIAL TOPICS (1–9)

MATHEMATICS (MATH)

Eberly College of Science

MATH 001 DEVELOPMENTAL MATHEMATICS (6) Arithmetic operations, ratios, proportions, percents; measurement; polynomial and rational expressions; exponents, radicals; equations, inequalities, systems of equations; graphing; applications. Students who have passed MATH 003 may not schedule this course for credit. This course may not be used to satisfy the basic minimum requirements for graduation in any baccalaureate degree program.

MATH 002 ELEMENTARY GEOMETRY WITH PROBLEM SOLVING (4) Geometric congruence, similarity, area, surface area, volume, introductory trigonometry; emphasis on logical reasoning skills and the solution of applied problems. This course may not be used to satisfy the basic minimum requirements for graduation in any baccalaureate degree program. Prerequisite: MATH 001, 2 units of high school algebra or satisfactory performance on the mathematics proficiency examination

MATH 003 BASIC SKILLS (3) Natural numbers; integers; rational numbers; decimals; ratio, proportion; percent; graphs; applications. Students who have passed MATH 001 may not schedule this course for credit. This course may not be used to satisfy the basic minimum requirements for graduation in any baccalaureate degree program.

MATH 004, 021 GQ, AND 022 GQ form a three-semester sequence in intermediate algebra, college algebra, and analytic geometry. MATH 026 GQ is a one-semester course in plane trigonometry. Students are placed in the appropriate course depending on the results of the mathematics proficiency examinations.

MATH 004 INTERMEDIATE ALGEBRA (3) Algebraic expressions; linear, absolute value equations and inequalities; lines; systems of linear equations; integral exponents; polynomials; factoring. This course may not be used to satisfy the basic minimum requirements for graduation in any baccalaureate degree program. Prerequisite: basic arithmetic skills or satisfactory performance on the mathematics proficency examination

MATH 017 (GQ) FINITE MATHEMATICS (3) Introduction to logic, sets, probability. Prerequisite: 2 units of high school mathematics

MATH 018 (GQ) ELEMENTARY LINEAR ALGEBRA (3) Linear functions; systems of equations; matrices; linear programming. Prerequisite: 2 units of high school mathematics

MATH 021 (GQ) COLLEGE ALGEBRA I (3) Quadratic equations; equations in quadratic form; word problems; graphing; algebraic fractions; negative and rational exponents; radicals. Prerequisite: MATH 004 or satisfactory performance on the mathematics proficiency examination

MATH 022 (GQ) COLLEGE ALGEBRA II AND ANALYTIC GEOMETRY (3) Relations, functions, graphs; polynomial, rational functions, graphs; word problems; nonlinear inequalities; inverse functions; exponential, logarithmic functions; conic sections; simultaneous equations. Prerequisite: MATH 021 or satisfactory performance on the mathematics proficiency examination

MATH 026 (GQ) PLANE TRIGONOMETRY (3) Trigonometric functions; solutions of triangles; trigonometric equations; identities. Prerequisite: MATH 021 or satisfactory performance on the mathematics proficiency examination; 1 unit of geometry

MATH 030 (GQ) PROBLEM SOLVING (3) Concepts in problem solving; reducing new problems to old ones; techniques for attacking problems; building mathematical models.

MATH 035 (GQ) GENERAL VIEW OF MATHEMATICS (3) Survey of mathematical thought in logic, geometry, combinatorics, and chance.

MATH 036 (GQ) INSIGHTS INTO MATHEMATICS (3) Examples of mathematical thought in number theory, topology, theory of symmetry, and chance. Prerequisite: one unit of algebra or MATH 004

MATH 037 DIVERSE CULTURAL ASPECTS OF MATHEMATICS (3) The mathematics of the following civilizations and individuals: Egyptian, Babylonian, Islamic, Hypatia, deBreteuil, German, Agnesi, and Noether.

MATH 040 GQ covers all the topics in MATH 004, 021 GQ, 022 GQ, and 026 GQ in one semester, MATH 041 GQ covers the same topics in trigonometry and analytic geometry as MATH 040 GQ. These courses are designed to prepare students for MATH 140 GQ. Students are placed in the appropriate course depending upon the results of the mathematics proficiency examinations.

MATH 040 (GQ) ALGEBRA, TRIGONOMETRY, AND ANALYTIC GEOMETRY (5) Concepts of algebra; equations; inequalities; functions; graphs; polynomial and rational functions; exponential and logarithmic functions; trigonometry; analytic geometry; complex numbers. Prerequisite: satisfactory performance on the mathematics proficiency examination

MATH 041 (GQ) TRIGONOMETRY AND ANALYTIC GEOMETRY (3) Straight lines; circles; functions and graphs; graphs of polynomial and rational functions; exponential and logarithmic functions; trigonometry; conic sections. Prerequisite: MATH 021 or satisfactory performance on the mathematics proficiency examination

MATH 081 (GQ) TECHNICAL MATHEMATICS I (3) Algebraic expressions, equations, systems of equations, trigonometric functions, graphs, solution of triangles, vectors. Prerequisite: MATH 004 or satisfactory performance on the mathematics proficiency examination

MATH 082 (GQ) TECHNICAL MATHEMATICS II (3) Exponents, radicals, complex numbers, theory of equations, inequalities, half angle and double angle formulas, inverse trigonometric functions, exponential, logarithm, conic sections. Prerequisite: MATH 081

MATH 083 (GQ) TECHNICAL CALCULUS (4) Limits, derivatives of algebraic functions, implicit differentiation, related rates, applied extrema problems, curve sketching, integration, numerical integration, applications of integration, integration techniques, differential equations. Prerequisite: MATH 082

MATH 097 SPECIAL TOPICS (1–9)

MATH 110 GQ and MATH 140 GQ, 141 GQ are two sequences that discuss differential and intergral calculus. They differ in the areas where calculus is applied. The MATH 110 GQ, 111 GQ sequence includes applications from business: the engineering sciences. A student who wants to change from one sequence to another should consult with the chair of the mathematics department.

MATH 110 (GQ) TECHNIQUES OF CALCULUS I (4) Functions, graphs, derivatives, integrals, techniques of differentiation and integration, exponentials, improper integrals, applications. Students may take only one course for credit from MATH 110, 140, 140A, and 140B. Prerequisite: MATH 022 or satisfactory performance on the mathematics proficiency examination

MATH 111 (GQ) TECHNIQUES OF CALCULUS II (2) Analytic geometry, partial differentiation, maxima and minima, differential equations. Prerequisite: MATH 110

MATH 140 (GQ) CALCULUS WITH ANALYTIC GEOMETRY I (4) Functions, limits; analytic geometry; derivatives, differentials, applications; integrals, applications. Students may only take one course for credit from MATH 110, 140, 140A, and 140B. Prerequisite: MATH 022, MATH 026; or MATH 040 or MATH 041; or satisfactory performance on the mathematics proficiency examination

MATH 140A (GQ) CALCULUS, ANALYTIC GEOMETRY, ALGEBRA, AND TRIGONOMETRY (6) Review of algebra and trigonometry; analytic geometry; functions; limits; derivatives, differentials, applications; integrals, applications. Students may take only one course for credit from MATH 110, 140, 140A, and 140B. Prerequisite: satisfactory performance on the mathematics proficiency examination

MATH 140B (GQ) CALCULUS AND BIOLOGY I (4) Functions, limits, analytic geometry; derivatives, differentials, applications from biology; integrals, applications from biology. Students may take only one course for credit from MATH 110, 140, 140A, and 140B. Prerequisite: MATH 022, MATH 026; MATH 040, MATH 041 or satisfactory performance on mathematics proficiency examination

MATH 140E CALCULUS WITH ENGINEERING APPLICATIONS I (4) Functions; limits; analytic geometry; derivatives; differentials, applications; integrals, applications. Prerequisite: MATH 022, MATH 026; or MATH 040, MATH 041, or satisfactory performance in the mathematics proficiency examination

MATH 140S (GQ) CALCULUS WITH ANALYTIC GEOMETRY I (4) Functions, limits; analytic geometry; derivatives, differentials, applications; integrals, applications. Students may only take one course for credit from MATH 110, 140, 140A, and 140B. Prerequisite: MATH 022, MATH 026; or MATH 040 or MATH 041; or satisfactory performance on the mathematics proficiency examination

MATH 141 (GQ) CALCULUS WITH ANALYTIC GEOMETRY II (4) Derivatives, integrals, applications; sequences and series; analytic geometry; polar coordinates. Students may take only one course for credit from MATH 141 and 141B. Prerequisite: MATH 140, MATH 140A, OR MATH 140B

MATH 141B (GQ) CALCULUS AND BIOLOGY II (4) Derivatives, integrals, applications from biology; sequences and series; analytic geometry; polar coordinates. Students may take only one course for credit from MATH 141 and 141B. Prerequisite: MATH 140B

MATH 141E CALCULUS WITH ENGINEERING APPLICATIONS II (4) Integration, applications; sequences and series; parametric equations, application. Prerequisite: MATH 140, MATH 140A, MATH 140B, or MATH 140E

MATH 142 MATHEMATICA FOR CALCULUS I (1) Problem solving using Mathematica in a UNIX environment. Prerequisite: MATH 022, MATH 026; or MATH 040 or MATH 041 Concurrent: MATH 140

MATH 143 MATHEMATICA II (1) Problem solving using Mathematica in a UNIX environment. Prerequisite: MATH 140D

MATH 197 SPECIAL TOPICS (1–9)

MATH 199 (GI) FOREIGN STUDIES (1–12)

MATH 200 (GQ) PROBLEM SOLVING IN MATHEMATICS (3) Mathematical ways of thinking, number sequences, numeracy, symmetry, regular polygons, plane curves, methods of counting, probability and data analysis. For elementary and special education teacher certification candidates only.
MATH 220 (GQ) MATRICES (2) Systems of linear equations; matrix algebra; eigenvalues and eigenvectors; linear systems of differential equations. Prerequisite: MATH 110 or MATH 140
MATH 230 CALCULUS AND VECTOR ANALYSIS (4) Three-dimensional analytic geometry; vectors in space; partial differentiation; double and triple integrals; integral vector calculus. Students who have passed either Math. 231 or 232 may not schedule Math. 230 for credit. Prerequisite: MATH 141
MATH 231 CALCULUS OF SEVERAL VARIABLES (2) Analytic geometry in space; partial differentiation and applications. Students who have passed MATH 230 may not schedule this course. Prerequisite: MATH 141
MATH 232 INTEGRAL VECTOR CALCULUS (2) Multidimensional analytic geometry, double and triple integrals; potential fields; flux; Green's, divergence and Stokes' theorems. Students who have passed MATH 230 may not schedule this course for credit. Prerequisite: MATH 231
MATH 250 ORDINARY DIFFERENTIAL EQUATIONS (3) First- and second-order equations; special functions; Laplace transform solutions; higher order equations. Students who have passed MATH 251 may not schedule this course for credit. Prerequisite: MATH 141
MATH 251 ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS (4) First- and second-order equations; special functions; Laplace transform solutions; higher order equations; Fourier series; partial differential equations. Prerequisite: MATH 141
MATH 294 RESEARCH PROJECT (1–12)
MATH 296 INDEPENDENT STUDIES (1–18)
MATH 297 SPECIAL TOPICS (1–9)
MATH 310 ELEMENTARY COMBINATORICS (3) Fundamental techniques of enumeration and construction of combinatorial structures, permutations, recurrences, inclusion-exclusion, permanents, 0, 1- matrices, Latin squares, combinatorial designs. Prerequisite: MATH 220
MATH 311W CONCEPTS OF DISCRETE MATHEMATICS (3) Introduction to mathematical proofs; elementary number theory and group theory. Students who have passed CSE 260 may not schedule this course for credit. Prerequisite: MATH 141
MATH 312 CONCEPTS OF REAL ANALYSIS (3) An introduction to rigorous analytic proofs involving properties of real numbers, continuity, differentiation, integration, and infinite sequences and series. Prerequisite: MATH 141
MATH 318 (STAT) ELEMENTARY PROBABILITY (3) Combinatorial analysis, axioms of probability, conditional probability and independence, discrete and continuous random variables, expectation, limit theorems, additional topics. Students who have passed either MATH(STAT) 414 or 418 may not schedule this course for credit. Prerequisite: MATH 141
MATH 319 (STAT) APPLIED STATISTICS IN SCIENCE (3) Statistical inference: principles and methods, estimation and testing hypotheses, regression and correlation analysis, analysis of variance, computer analysis. Students who have passed MATH(STAT) 415 may not schedule this course for credit. Prerequisite: MATH 318 or knowledge of basic probability
MATH 397 SPECIAL TOPICS (1–9)
MATH 399 (GI) FOREIGN STUDIES (1–12)
MATH 401 INTRODUCTION TO ANALYSIS I (3) Review of calculus, properties of real numbers, infinite series, uniform convergence, power series. Students who have passed Math. 403 may not schedule this course. Prerequisite: MATH 230 or MATH 231
MATH 403 CLASSICAL ANALYSIS I (3) Topology of Rn, compactness, continuity of functions, uniform convergence, Arzela-Ascoli theorem in the plane, Stone-Wierstrass theorem. Prerequisite: MATH 312
MATH 404 CLASSICAL ANALYSIS II (3) Differentiation of functions from Rn to Rm, implicit function theorem, Riemann integration, Fubini's theorem, Fourier analysis. Prerequisite: MATH 403
MATH 405 ADVANCED CALCULUS FOR ENGINEERS AND SCIENTISTS I (3) Vector calculus, linear algebra, ordinary and partial differential equatinos. Students who have passed MATH 411 or 412 may not take this course for credit. Prerequisite: MATH 231; MATH 250 or MATH 251
MATH 406 ADVANCED CALCULUS FOR ENGINEERS AND SCIENTISTS II (3) Complex analytic functions, sequences and series, residues, Fourier and Laplace transforms. Students who have passed MATH 421 may not take this course for credit. Prerequisite: MATH 405
MATH 411 ORDINARY DIFFERENTIAL EQUATIONS (3) Linear ordinary differential equations; existence and uniqueness questions; series solutions; special functions; eigenvalue problems; Laplace transforms; additional topics and applications. Prerequisite: MATH 230 or MATH 231; MATH 250 or MATH 251
MATH 412 FOURIER SERIES AND PARTIAL DIFFERENTIAL EQUATIONS (3) Orthogonal systems and Fourier series; derivation and classification of partial differential equations; eigenvalue function method and its applications; additional topics. Prerequisite: MATH 230 or MATH 231; MATH 250 or MATH 251
MATH 414 (STAT) INTRODUCTION TO PROBABILITY THEORY (3) Probability spaces, discrete and continuous random variables, transformations, expectations, generating functions, conditional distributions, law of large numbers, central limit theorems. Students may take only one course from MATH(STAT) 414 and 418 for credit. Prerequisite: MATH 230 or MATH 231
MATH 415 (STAT) INTRODUCTION TO MATHEMATICAL STATISTICS (3) A theoretical treatment of statistical inference, including sufficiency, estimation, testing, regression, analysis of variance, and chi-square tests. Prerequisite: MATH 414

MATH 416 (STAT) STOCHASTIC MODELING (3) Review of distribution models, probability generating functions, transforms, convolutions, Markov chains, equilibrium distributions, Poisson process, birth and death processes, estimation. Prerequisite: MATH 318 OR MATH 414; MATH 230

MATH 417 QUALITATIVE THEORY OF DIFFERENTIAL EQUATIONS (3) Linear differential equations, stability of stationary solutions, ordinary bifurcation, exchange of stability, Hopf bifurcation, stability of periodic solutions, applications. Prerequisite: MATH 220, MATH 250

MATH 418 (STAT) PROBABILITY (3) Fundamentals and axioms, combinatorial probability, conditional probability and independence, probability laws, random variables, expectation; Chebyshev's inequality. Students may take only one course from MATH(STAT) 414 and 418 for credit. Prerequisite: MATH 230 or MATH 231

MATH 419 (PHYS) THEORETICAL MECHANICS (3) Principles of Newtonian, Lagrangian, and Hamiltonian mechanics of particles with applications to vibrations, rotations, orbital motion, and collisions. Prerequisite: MATH 230 or MATH 231; MATH 250 or MATH 251; PHYS 212, PHYS 213, and PHYS 214; or PHYS 203 or PHYS 204

MATH 420 ELEMENTARY INTRODUCTION TO CHAOTIC DYNAMICS AND FRACTAL GEOMETRY (3) An introduction to the theory of fractals for undergraduates in mathematics, science, engineering, economics, and computer science. Prerequisite: MATH 140, MATH 141, MATH 220 or MATH 110, MATH 111, MATH 220

MATH 421 COMPLEX ANALYSIS (3) Infinite sequences and series; algebra and geometry of complex numbers; analytic functions; integration; power series; residue calculus; conformal mapping, applications. Prerequisite: MATH 230, MATH 232, OR MATH 405; MATH 401 OR MATH 403

MATH 422 WAVELETS AND FOURIER ANALYSIS: THEORY AND APPLICATIONS (3) Fundamental mathematical issues of the theory of wavelets for senior undergraduate and graduate students in mathematics, engineering, physics, and computer science. Prerequisite: complete one of the following: MATH 312, MATH 401, MATH 403, MATH 405, or MATH 412

MATH 426 INTRODUCTION TO MODERN GEOMETRY (3) Plane and space curves; space surfaces; curvature; intrinsic geometry of surfaces; Gauss-Bonnet theorem; covariant differentiation; tensor analysis. Prerequisite: MATH 401 OR MATH 403

MATH 427 FOUNDATIONS OF GEOMETRY (3) Euclidean and various non-Euclidean geometries and their development from postulate systems. Prerequisite: MATH 230 or MATH 231

MATH 429 INTRODUCTION TO TOPOLOGY (3) Metric spaces, topological spaces, separation axioms, product spaces, identificaiton spaces, compactness, connectedness, fundamental group. Prerequisite: MATH 311W

MATH 435 BASIC ABSTRACT ALGEBRA (3) Elementary theory of groups, rings, and fields. Prerequisite: MATH 311W

MATH 436 LINEAR ALGEBRA (3) Vector spaces and linear transformations, canonical forms of matrices, elementary divisors, invariant factors; applications. Prerequisite: MATH 311W

MATH 437 ALGEBRAIC GEOMETRY (3) Study of curves in the plane defined by polynomial equations $p(x,y)= 0$. Projective equivalence, singular points, classification of cubics. Prerequisite: MATH 230 or MATH 231

MATH 441 MATRIX ALGEBRA (3) Determinants, matrices, linear equations, characteristic roots, quadratic forms, vector spaces. Students who have passed Math. 436 may not schedule this course. Prerequisite: MATH 220

MATH 450 MATHEMATICAL MODELING (3) Constructing mathematical models of physical phenomena; topics include pendulum motion, polymer fluids, chemical reactions, waves, flight, and chaos. Prerequisite: MATH 405 or MATH 412

MATH 451 (CSE) NUMERICAL COMPUTATIONS (3) Algorithms for interpolation, approximation, integration, nonlinear equations, linear systems, fast FOURIER transform, and differential equations emphasizing computational properties and implementation. Students may take only one course for credit from MATH 451 and 455. Prerequisite: CMPSC 201C, CMPSC 201F, or CSE 103; MATH 230 or MATH 231

MATH 455 (CSE) INTRODUCTION TO NUMERICAL ANALYSIS I (3) Floating point computation, numerical rootfinding, interpolation, numerical quadrature, direct methods for linear systems. Students may take only one course for credit from MATH 451 and MATH 455. Prerequisite: CMPSC 201C, CMPSC 201F, or CSE 103; MATH 220; MATH 230 or MATH 231

MATH 456 (CSE) INTRODUCTION TO NUMERICAL ANALYSIS II (3) Polynomial and piecewise polynomial approximation, matrix least squares problems, numerical solution of eigenvalue problems, numerical solution of ordinary differential equations. Prerequisite: MATH 455

MATH 457 INTRODUCTION TO MATHEMATICAL LOGIC (3) Propositional logic, first-order predicate logic, axioms and rules of inference, structures, models, definability, completeness, compactness. Prerequisite: MATH 311W or PHIL 212; 3 additional credits in philosophy

MATH 459 COMPUTABILITY AND UNSOLVABILITY (3) An introduction to the theory of recursive functions; solvable and unsolvable decision problems; applications. Prerequisite: MATH 311W

MATH 461 (PHYS) THEORETICAL MECHANICS (3) Continuation of Math.(Phys.) 419. Theoretical treatment of dynamics of a rigid body, theory of elasticity, aggregates of particles, wave motion, mechanics of fluids. Prerequisite: MATH 419

MATH 465 NUMBER THEORY (3) Elements, divisibility of numbers, congruences, residues, and forms. Prerequisite: MATH 230 or MATH 231

MATH 467 (CSE) FACTORIZATION AND PRIMALITY TESTING (3) Prime sieves, factoring, computer numeration systems, congruences, multiplicative functions, primitive roots, cryptography, quadratic residues. Students who have passed MATH 465 may not schedule this course. Prerequisite: MATH 311W
MATH 468 MATHEMATICAL CODING THEORY (3) Shannon's theorem, block codes, linear codes, Hamming codes, Hadamard codes, Golay codes, Reed-Muller codes, bounds on codes, cyclic codes. Prerequisite: MATH 311W; advanced calculus
MATH 469 MATHEMATICS OF ALGORITHMS (3) Binomial identities; recurrence relations, operator methods; asymptotic methods. Prerequisite: advanced calculus
MATH 470 ALGEBRA FOR TEACHERS (3) An introduction to algebraic structures and to the axiomatic approach, including the elements of linear algebra. Designed for teachers and prospective teachers. Students who have passed Math. 435 may not schedule this course. Prerequisite: MATH 311W
MATH 471 GEOMETRY FOR TEACHERS (4) Problem solving oriented introduction to Euclidean and non-Euclidean geometries; construction problems and geometrical transformations via "Geometer's Sketchpad" software. Intended primarily for those seeking teacher certification in secondary mathematics. Students who have passed MATH 427 may not schedule this course. Prerequisite: MATH 311W
MATH 483 APPLIED MODERN ALGEBRA II (3) Semigroups, groups, permutation groups, machines, Polya enumeration theory, switching functions, de Bruijn's theorem, fast adders. Prerequisite: MATH 311W
MATH 484 LINEAR PROGRAMS AND RELATED PROBLEMS (3) Introduction to theory and applications of linear programming; the simplex algorithm and newer methods of solution; duality theory. Prerequisite: MATH 220; MATH 230 or MATH 231
MATH 485 GRAPH THEORY (3) Introduction to the theory and applications of graphs and directed graphs. Emphasis on the fundamental theorems and their proofs. Prerequisite: MATH 311W
MATH 486 MATHEMATICAL THEORY OF GAMES (3) Basic theorems, concepts, and methods in the mathematical study of games of strategy; determination of optimal play when possible. Prerequisite: MATH 484
MATH 493 MATHEMATICS RECITATION INSTRUCTOR TRAINING (1 per semester, maximum of 3) Instruction and practice in the role of recitation instructor. Prerequisite: 18 credits in mathematics
MATH 494 RESEARCH PROJECT (1–12)
MATH 496 INDEPENDENT STUDIES (1–18)
MATH 497, 498 SPECIAL TOPICS (1–9)
MATH 499 (GI) FOREIGN STUDIES (1–12)
NOTE: Courses in computer science and statistics are listed separately.

MATHEMATICS (MTHBD)

Penn State Erie, The Behrend College
MTHBD 091 (GQ) TECHNICAL MATHEMATICS I (5) Algebraic expressions, exponents, radicals, equations, graphs, systems of equations, trigonometric functions, solutions of right angles, vectors, complex numbers. Students may take only MATH 081 and 082 or MTHBD 091 for credit. Prerequisite: MATH 004 or satisfactory performance on the Mathematics proficiency examination
MTHBD 092 (GQ) TECHNICAL MATHEMATICS II (5) Logarithms, inverse trigonometric functions, trigonometric identities, inequalities, series, limits, differentiation, repeated and implicit differentiation, applications, integration, areas, volumes, differential equations. Students may take only MATH 082 and 083 or MTHBD 092 for credit. Prerequisite: MATH 081, MATH 082; OR MTHBD 091
MTHBD 097 SPECIAL TOPICS (1–9)
MTHBD 197 SPECIAL TOPICS (1–9)
MTHBD 210 CALCULUS AND ANALYTIC GEOMETRY WITH APPLICATIONS (4) Topics in analytic geometry and calculus, with emphasis on applications in technology. Prerequisite: trigonometry and an introductory course in calculus
MTHBD 211 INTERMEDIATE CALCULUS AND DIFFERENTIAL EQUATIONS WITH APPLICATIONS (4) Topics in infinite series, functions of several variables, partial differentiations, multiple integrals, introduction to ordinary differential equations. Prerequisite: MTHBD 210
MTHBD 296 INDEPENDENT STUDIES (1–18)
MTHBD 297 SPECIAL TOPICS (1–9)
MTHBD 315W APPLIED MODERN ALGEBRA I (4) Introduction to mathematical proofs; elementary number theory; group theory, relations, and partial orderings; permutations. Prerequisite: MATH 141
MTHBD 397 SPECIAL TOPICS (1–9)
MTHBD 420 INTRODUCTION TO REAL ANALYSIS I (3) Review of calculus, properties of real numbers, infinite series, power series, properties of real-valued functions, uniform convergence. Students who have passed MATH 403 may not schedule this course. Prerequisite: MATH 230 OR MATH 231; MATH 311W or MTHBD 315W
MTHBD 422 COMPLEX ANALYSIS (3) Algebra and geometry of complex numbers, analytic functions, power series and their convergence, residue calculus, conformal mappings, applications. Prerequisite: MATH 230 OR MATH 232; MATH 401, MATH 403, MATH 405, OR MTHBD 420; MATH 311W OR MTHBD 315W
MTHBD 423 (CMPBD) INTRODUCTION TO NUMERICAL ANALYSIS I (3) Floating point computation, numerical rootfinding, interpolation, numerical quadrature, direct methods for linear systems. Students may take only one course for credit from MATH 451 and MTHBD 423. Prerequisite: MATH 220, MATH 230, or MATH 231; at least 3 credits in computer science

MTHBD 424 (CMPBD) INTRODUCTION TO NUMERICAL ANALYSIS II (3) Polynomials and piecewise polynomial approximation, matrix least square, problems, numerical solution of eigenvalue problems, numerical solutions of ordinary differential equations. Prerequisite: MATH 455 OR MTHBD 423
MTHBD 425 ORDINARY DIFFERENTIAL EQUATIONS (3) Linear ordinary differential equations; existence and uniqueness questions; qualitative theory of nonlinear differential equations; phase plane analysis; additional topics. Prerequisite: MATH 220; MATH 230 or MATH 231; MATH 250 or MATH 251
MTHBD 428 FOURIER SERIES AND PARTIAL DIFFERENTIAL EQUATIONS (3) Orthogonal systems and Fourier series; derivation and classification of partial differential equations; eigenvalue function method and its n applications; additional topics. Prerequisite: MATH 230 or MATH 231; MATH 250 or MATH 251
MTHBD 431 BASIC ABSTRACT ALGEBRA (3) Elementary theory of groups, rings, and fields. Prerequisite: MATH 311W OR MTHBD 315W
MTHBD 432 INTRODUCTION TO TOPOLOGY (3) Metric spaces, topological spaces, separation axioms, Urysohn's lemma, products, quotients, compactness, Tychonoff theorem, connectedness. Prerequisite: MATH 230 OR MATH 232; MATH 311W OR MTHBD 315W
MTHBD 434 MATRIX ALGEBRA (3) Matrices, determinants, linear equations, characteristic roots, quadratic forms, vector spaces. Students who have passed MATH 436 may not schedule this course. Prerequisite: MATH 220; MATH 311W OR MTHBD 315W, AT LEAST 3 CREDITS IN COMPUTER SCIENCE
MTHBD 446 MATHEMATICAL MODELING (3) Differential and difference equations and their application to biology, chemistry, and physics; techniques in dynamical systems theory. Prerequisite: MATH 250 or MATH 251
MTHBD 450 MATHEMATICAL METHODS OF OPERATIONS RESEARCH (3) Survey of linear and nonlinear programming; mathematics of optimization; queues; simulation. Prerequisite: MATH 220, MATH 230, STAT 301
MTHBD 472 LINEAR PROGRAMS AND RELATED PROBLEMS (3) Introduction to the theory and applications of linear programming; the simplex algorithm and new methods of solution, duality theory. Prerequisite: MATH 141, AT LEAST 3 CREDITS IN COMPUTER SCIENCE
MTHBD 475 NUMBER THEORY I (3) Elements, divisibility of numbers, congruences, residues, codes, and residues. Prerequisite: MATH 230 OR MATH 231; MATH 311W OR MTHBD 315W
MTHBD 477 FOUNDATIONS OF GEOMETRY (3) Euclidean and various non-Euclidean geometries and their development from postulate systems. Prerequisite: MATH 230 OR MATH 231; MATH 311W OR MTHBD 315W
MTHBD 478 GEOMETRY FOR TEACHERS (1) Research in mathematics education using ideas from Euclidean and non-Euclidean geometry. Students who have passed MATH 471 may not schedule MTHBD 478. Prerequisite: MATH 311W or MTHBD 315W. Prerequisite or concurrent: MATH 427 or MTHBD 477
MTHBD 494 RESEARCH PROJECT (1–12)
MTHBD 495 INTERNSHIP (1–18)
MTHBD 496 INDEPENDENT STUDIES (1–18)
MTHBD 497 SPECIAL TOPICS (1–9)

MATHEMATICS EDUCATION (MTHED)

College of Education
MTHED 298 SPECIAL TOPICS (1–9)
MTHED 411 TEACHING SECONDARY MATHEMATICS I (3) Conditions for learning mathematics; methods for learning management; curricular goals, systems and procedures for developing them. Prerequisite: C I 295, CMPSC 101, MATH 231, MATH 311W
MTHED 412 TEACHING SECONDARY MATHEMATICS II (3) Teaching for mastery; systematic instructional design; evaluation of teaching secondary mathematics. Prerequisite: MTHED 411 Concurrent: C I 412W, C I 495C
MTHED 420 TEACHING MATHEMATICS IN THE ELEMENTARY SCHOOLS (3) Strategies for teaching mathematics at the elementary school level; analysis of the philosophy and content of contemporary programs of instruction. Prerequisite: LL ED 400, LL ED 401, LL ED 402; a grade of C or better required in MATH 200; PSY 213 Concurrent: C I 495A or C I 495B; SCIED 458, SS ED 430W
MTHED 424 CONTEMPORARY SCHOOL MATHEMATICS PROGRAMS (3) In-depth analysis of school mathematics programs and the factors and forces influencing them; contemporary curriculum developments. Prerequisite: MTHED 412 or MTHED 420
MTHED 427 TEACHING MATHEMATICS IN TECHNOLOGY-INTENSIVE ENVIRONMENTS (3) Interaction among pedagogy, content, and technology in mathematics teaching and learning in technology-intensive environments; secondary, early college curricula; laboratory experience. Prerequisite: CMPSC 101; at least 18 credits of mathematics at or above the calculus level
MTHED 430 STUDENTS' MATHEMATICAL THINKING (3–6 per semester) Develop abilities in planning, conducting, and interpreting mathematics interviews to gain an understanding of students' thinking processes and current knowledge. Prerequisite: C I 495D, C I 495E, or experience teachnig mathematics
MTHED 496 INDEPENDENT STUDIES (1–18)
MTHED 497, 498 SPECIAL TOPICS (1–9)

MECHANICAL ENGINEERING (M E)

College of Engineering

M E 023 INTRODUCTION TO THERMAL SCIENCE (3) Application of the basic concepts of thermodynamics, fluid dynamics, and heat transfer to the solution of engineering problems. Prerequisite: CHEM 012

M E 030 ENGINEERING THERMODYNAMICS I (3) Basic thermodynamics concepts, properties of pure substances, first and second law analysis of systems and control volumes. Prerequisite: CHEM 012, MATH 141

M E 031 ENGINEERING THERMODYNAMICS II (3) Application of basic thermodynamics to mixtures; psychrometrics, combustion, and equilibrium. Availability, equations of state and property relationships. Prerequisite: M E 030, CMPSC 201C or CMPSC 201F

M E 033 FLUID FLOW (3) Thermodynamic and dynamic principles applied to fluid behavior; ideal, viscous, and compressible fluids under internal and external flow conditions. Prerequisite: E MCH 012, MATH 251; M E 023 or M E 030; MATH 230 or MATH 231

M E 050 MACHINE DYNAMICS (3) Force and motion relationships in constrained mechanisms; analysis of cam, gear, and linkage systems for motion and power transmission. Prerequisite: E MCH 012; Prerequisite or Concurrent: CMPSC 201C or CMPSC 201F

M E 051 MECHANICAL DESIGN (3) Specification of components such as shafts, bearings, and power transformers; optimal designs for operational, environmental, and manufacturing requirements. Prerequisite: E MCH 215; CMPSC 201C or CMPSC 201F

M E 054 DYNAMICS OF MECHANICAL SYSTEMS (3) Shock and vibration characteristics of mechanical systems; control of dynamic stresses and motion. Prerequisite: M E 050, MATH 220, MATH 251

M E 054 VIBRATION OF MECHANICAL SYSTEMS (3) Modeling and analysis of vibration characteristics of mechanical systems with single degree and multiple degrees of freedom. Vibration control by isolation, absorption and balancing. Prerequisite: M E 050, MATH 220, MATH 251

M E 066H ENGINEERING ANALYSIS (2) Simulation of mechanical engineering systems with mathematical models; methods of solution of system equations using digital and analog computers. Prerequisite: MATH 251

M E 082 MECHANICAL ENGINEERING MEASUREMENTS (3) Fundamentals of instrumentation and techniques for measurement of mechanical phenomena such as temperature, flow, pressure, force, stress, displacement, and acceleration. Prerequisite: E E 305

M E 082L MECHANICAL ENGINEERING MEASUREMENTS (3) Fundamentals of instrumentation and techniques for measurement of mechanical phenomena such as temperature, flow, pressure, force, stress, displacement, and acceleration.

M E 082P MECHANICAL ENGINEERING MEASUREMENTS Fundamentals of instrumentation and techniques for measurement of mechanical phenomena such as temperature, flow, pressure, force, stress, displacement, and acceleration.

M E 083 FLUIDS LABORATORY (1) Laboratory experience with fluid mechanics measurement techniques: flow visualization, pressure measurement, hot-wire anemometry, laser Doppler anemometry, computer data acquisition. Prerequisite: M E 033, M E 082

M E 084 HEAT TRANSFER LABORATORY (1) Application of the fundamental concepts associated with conduction, convection, and radiation to the actual measurements of heat transfer. Prerequisite: M E 033. Prerequisite or concurrent: M E 082, M E 412

M E 085 VIBRATIONS LABORATORY (1) Experimental measurement and analysis of mechanical system dynamics. Prerequisite: or concurrent: M E 054, M E 082

M E 086 AUTOMATIC CONTROLS LABORATORY (1) Experimental investigation of simple position, velocity, and temperature control systems with analog and digital controllers. Prerequisite: M E 082, M E 440

M E 087 INTEGRATED DESIGN AND ANALYSIS (1) Laboratory experience to promote the application of concepts simultaneously presented in junior required mechanical engineering courses. Prerequisite: any of the following: M E 031, M E 033, M E 050, M E 051, M E 054; or concurrently: M E 082

M E 088 ENGINEERING DESIGN I (3) Synthesis, analysis, and evaluation procedures in creative mechanical and thermal design, integrated with engineering fundamentals through authentic design projects. Prerequisite: M E 051. Prerequisite or concurrent: M E 082

M E 097 SPECIAL TOPICS (1–9)

M E 101S TOY FUNDAMENTALS: FIRST-YEAR SEMINAR (1) First-Year Seminar focusing on toy design and manufacture.

M E 102S SMART LEGO ROBOTS & DESIGN (1) First-Year Seminar focusing on the development of technology exploration kits for middle-school-aged children.

M E 103S THE ART AND SCIENCE OF MANUFACTURING: FIRST-YEAR SEMINAR (1) A First-Year Seminar focusing on the practical and non-technical aspects of manufacturing.

M E 104S ENVIRONMENTALLY CONSCIOUS ENGINEERING: FIRST-YEAR SEMINAR (1) A First-Year Seminar focusing on environmental issues as they pertain to the engineering profession.

M E 105S PRODUCT DISSECTION A: BICYCLES—FIRST-YEAR SEMINAR (1) A First-Year Seminar in which students analyze and disassemble a multi-speed bicycle.

M E 106S PRODUCT DISSECTION B: HOUSEHOLD APPLIANCES—FIRST-YEAR SEMINAR (1) A First-Year Seminar in which students analyze and disassemble household appliances.

M E 107S PRODUCT DISSECTION C: THE ENIGMATIC ENGINE—FIRST-YEAR SEMINAR (1) A First-Year Seminar in which students analyze and disassemble a single- cylinder lawnmower engine.

M E 120 ENGINEERING THERMODYNAMICS (4) Engineering thermodynamics and heat transfer, with pertinent applications to devices important in mechanical engineering. For students in engineering science. Prerequisite: CHEM 013, PHYS 211, and MATH 230 or MATH 231

M E 190S SPECIAL TOPICS IN MECHANICAL ENGINEERING: FIRST-YEAR SEMINAR (1) A First-Year Seminar focusing on issues related to Mechanical Engineering.

M E 288 PRODUCT DISSECTION (3) Dissection of products and processes; reverse engineering, examination of materials usage, manufacturing processes, design, invention, and consumer issues. Prerequisite: ED&G 100, PHYS 211

M E 297 SPECIAL TOPICS (1–9)

M E 403 ROCKET PROPULSION (3) Design and performance of rocket propulsion components and systems; thermodynamics, solid and liquid fuels, heat transfer, materials, controls, and instrumentation. Prerequisite: M E 033, M E 412

M E 405 INDOOR AIR QUALITY ENGINEERING (3) Prediction of the motion of contaminants (both gaseous particulate) in gas streams; analysis of ventilation systems and air pollution control systems; comparison of experimental sampling techniques. Prerequisite: M E 033 or equivalent

M E 409 GAS TURBINES (3) Thermodynamic cycles relating to gas turbines; analysis and performance of compressors, combustion chambers, single- and multi-stage turbines; recent developments. Prerequisite: M E 033 or M E 120

M E 410 POWER PLANTS (3) A study of fossil-fuel steam generation and utility plants, including cogeneration, gas turbine, and combined cycles. Prerequisite: M E 412

M E 411 REFRIGERATION AND AIR CONDITIONING (3).Theoretical principles, design, performance, and selection of various refrigeration and air-conditioning systems; building heat and cooling loads; solar heating. Prerequisite: M E 031, M E 412

M E 412 HEAT TRANSFER (3) Transient heat conduction; convection in laminar and turbulent flow; heat exchanger devices; boiling and condensation; radiation. Prerequisite: AERSP 308, AERSP 311, C E 360, or M E 033; CMPSC 201C or CMPSC 201F; MATH 220 or NUC E 309; MATH 251

M E 413 INTERNAL COMBUSTION ENGINES (3) Thermodynamic aspects of internal combustion engine design and performance; two- and four-stroke cycle, supercharged and non-supercharged, diesel and spark-ignition types. Prerequisite: M E 031 or M E 120

M E 414W THERMAL SYSTEM DESIGN (4) Design of thermal systems through component selection, system simulation and optimization. Development of tools and assessment of system economics and energy saving potential. Outline of recent developments on system controls. Prerequisite: ENGL 202C, M E 031, M E 412

M E 415W MECHANICAL SYSTEMS DESIGN (4) Design and analysis of mechanical components and systems. Application of fundamental design and analysis methods to open ended engineering problems. Prerequisite: ENGL 202C, I E 312, M E 051, M E 054

M E 416 (F SC) INTRODUCTION TO COMBUSTION (3) Concepts related to laminar and turbulent premixed and nonpremixed combustion with applications to propulsion and stationary systems. Prerequisite: M E 023 or M E 030

M E 417 THEORY OF ENGINEERING INSTRUMENTS (3) Basic principles of selected engineering instruments for measurement of length, area, pressure, time, motion, velocity (rectilinear and rotational), quantity (volume and weight), force, torque, work, temperature, heat. Prerequisite: M E 082

M E 418 PRINCIPLES OF TURBOMACHINERY (3) Application of Newton's laws of motion and basic laws of thermodynamics to analysis of fluid flow in turbomachinery. Prerequisite: M E 031, M E 033

M E 420 HEAT-EXCHANGER DESIGN (3) Thermal design and application of different heat-exchanger types, including surface selection and design optimization. Prerequisite: M E 412

M E 421 VISCOUS FLOW ANALYSIS AND COMPUTATION (3) Investigate analytical and computational methods for solving the differential equations describing fluid flow. Incompressible external flows past objects and internal flows in pipes and ducts are some problems considered. Prerequisite: M E 033, M E 120, AERSP 311, or C E 261; CMPSC 201C or CMPSC 201F; MATH 220, MATH 251

M E 434 COMPRESSIBLE FLOW I (3) Introductory compressible flow (gas dynamics), mathematical background, and physical concepts of isentropic flow, shock waves, expansion waves, and applications. Prerequisite: M E 031, M E 033

M E 440 MODELING OF DYNAMIC SYSTEMS (3) Modeling and analysis of dynamic interactions in engineering systems. Classical and state variable methods; digital simulation; stability and dynamic response. Prerequisite: M E 054, M E 082

M E 450 INTRODUCTION TO COMPUTER-AIDED ANALYSIS OF MACHINE DYNAMICS (3) Techniques and formulations for computer based kinematic and dynamic analyses of machines. Prerequisite: M E 050

M E 451 ADVANCED MACHINE DESIGN PROBLEMS (3) Special machine design problems in unusual types of springs; gear problems and involutometry; cam design and application; multiple diameter shaft deflections and ball bearings. Prerequisite: M E 051, M E 054

M E 452 VEHICLE ROAD DYNAMICS (3) Investigations of three-dimensional dynamics and design into the study of vehicle dynamics including tire forces, suspension, and stability. Prerequisite: M E 054

M E 454 (E MCH) ANALYSIS AND DESIGN IN VIBRATION ENGINEERING (3) Application of Lagrange's equations to mechanical system modeling, multiple- degree-of-freedom systems, experimental and computer methods; some emphasis on design applications. Prerequisite: E MCH 012 or E MCH 112H; M E 054 or E SC 407H

M E 455 AUTOMATIC CONTROL SYSTEMS (3) Dynamic analysis of systems involving automatic control of position, speed, power, flow, pressure, temperature, and other physical quantities. Prerequisite: M E 033, M E 440

M E 456 (I E) INDUSTRIAL ROBOT APPLICATIONS (3) Introduction to robotics, with emphasis on robot selection, programming, and economic justification for manufacturing applications. Prerequisite: MATH 220; MATH 250 or MATH 251; I E 328 or M E 051; CMPSC 201C or CMPSC 201F

M E 458 NOISE CONTROL IN MACHINERY (3) Nature of noise sources in machine elements and systems. Propagation and reduction of noise. Effects of noise on man. Prerequisite: M E 033, M E 054

M E 460 (NUC E) RELIABILITY AND RISK CONCEPTS IN DESIGN (3) Introduction to reliability mathematics. Failure data collection and analysis. Components and systems reliability prediction. Effects of maintenance on reliability. Risk Analysis. Case studies in engineering applications. Prerequisite: MATH 250 or MATH 251; STAT 401 or I E 424 or NUC E 309

M E 461 (E MCH) APPLIED FINITE ELEMENT ANALYSIS (3) Computer modeling and fundamental analysis of solid, fluid, and heat flow problems using existing computer codes. Prerequisite: E MCH 013, E MCH 110H, or E MCH 210: CMPSC 201C or CMPSC 201F

M E 462 MICROCOMPUTER INTERFACING FOR MECHANICAL ENGINEERS (4) Interfacing of electro-mechanical systems to microcomputers for data acquistion, data analysis and digital control. Prerequisite: M E 082 and seventh-semester standing

M E 466H FUNDAMENTALS OF COMPUTER GRAPHICS (3) Introduction to computer graphics, including static, refresh, color, and computer-aided design applications. Prerequisite: M E 066; sixth-semester standing

M E 470 FUNDAMENTALS OF AIR POLLUTION (3) Natural and man-made sources of pollution; atmospheric dispersion; biological and health effects; control systems; legislation and regulations. Prerequisite: M E 023 or M E 030

M E 476 LUBRICATION IN MACHINE DESIGN (3) Lubricants and lubrication with applications to design aspects of machines and mechanisms including bearings, gears, cams, and automotive engines. Prerequisite: MATH 251, M E 051

M E 494 SENIOR THESIS (1–9) Students must have approval of a thesis adviser before scheduling this course.

M E 496 INDEPENDENT STUDIES (1–18)

M E 497 SPECIAL TOPICS (1–9)

MECHANICAL ENGINEERING (ME BD)

Penn State Erie, The Behrend College

ME BD 097, 197 SPECIAL TOPICS (1–9)

ME BD 240 ELEMENTARY FLUID MECHANICS (3) Introduction to fluid statics, kinematics, and dynamics. Incompressible and compressible ideal fluids under internal and external flow conditions. Prerequisite: CMPSC 201C or CMPSC 201F; E MCH 012, MATH 251. Prerequisite or concurrent: E MCH 013, M E 030

ME BD 241 HEAT TRANSFER (3) Modes of heat transfer, steady state and transient conduction, free and forced convection, and radiation. Prerequisite: MATH 251, M E 030, ME BD 240

ME BD 245 FLUID FLOW AND HEAT TRANSFER LABORATORY (1) Experimental work to enhance understanding of thermodynamics, fluid dynamics, and heat transfer. Prerequisite: ME BD 240. PREREQUISITE OR CONCURRENT: ME BD 241

ME BD 295 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor

ME BD 296 INDEPENDENT STUDIES (1–18)

ME BD 297 SPECIAL TOPICS (1–9)

ME BD 320W MEASUREMENTS AND INSTRUMENTATION (4) Measurement concepts, probability and statistics, error analysis; electro- mechanical transducers, applied electrical and mechanical measurements, electrical and electronics instruments, data acquisition and instrumentation systems. Prerequisite: E E 220 or E E 251

ME BD 329 CONTROL THEORY (3) Introduction to control of mechanical and electrical systems; mathematical modeling; performance and design of control systems. Prerequisite: CMPSC 201C or CMPSC 201F, E E 220 or E E 251, MATH 251

ME BD 340 COMPUTER-AIDED ENGINEERING (3) Introduction to the tools and techniques of computer-aided design, including CAD, spreadsheets, numerical methods, and finite element analysis. Prerequisite: CMPSC 201C or CMPSC 201F; BDENG 100S or ED&G 100. Prerequisite or concurrent: E MCH 013, MATH 220, MATH 251

ME BD 343 THERMAL SYSTEM DESIGN (3) Theory, analysis, design, selection, and application of energy conversion systems. Prerequisite: ME BD 240, ME BD 241, ME BD 340

ME BD 395 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor

ME BD 423 APPLIED COMPUTATIONAL FLUID DYNAMICS (3) Introduction to theory and application of computational techniques for solving fluid flow and heat transfer. Prerequisite: ME BD 240, ME BD 241, ME BD 340

ME BD 425 ADVANCED THERMAL ANALYSIS (3) Use of analytical and numerical techniques for modelling, analysis and design of heat transfer systems. Prerequisite: ME BD 423

ME BD 427 INCOMPRESSIBLE AERODYNAMICS (3) Analysis of lift and drag using potential flow theory, effects of viscosity on potential flow calculations, wind tunnel testing. Prerequisite: ME BD 240
ME BD 443 MACHINE DYNAMICS (3) Kinematic and dynamic analysis and design of linkages, cams and gears. Dynamics of machines including static and dynamic forces and balancing. Prerequisite: E MCH 012. Prerequisite or concurrent: ME BD 340
ME BD 445 MACHINE DESIGN (3) Design of machine elements and connections, stress analysis, and modes of failure. Selection of materials for mechanical design. Prerequisite: ME BD 443. PREREQUISITE OR CONCURRENT: ME BD 446
ME BD 446 MATERIALS PROPERTIES AND CHARACTERIZATION (4) Properties and characteristics of materials. Prerequisite: CHEM 012, E MCH 013
ME BD 449 APPLIED FINITE ELEMENT ANALYSIS (3) Review of matrix algebra; discretization; finite element formulation; application of finite element computer codes. Prerequisite: ME BD 241, ME BD 340
ME BD 455 ENGINEERING FOR MANUFACTURING (4) Manufacturability, the selection of the most effective materials and processes, and quality assurance. Prerequisite: ME BD 446
ME BD 462 APPLIED STRESS ANALYSIS (3) Advanced topics in applied and experimental mechanics of materials, design of structural and machine components; application of finite element codes. Prerequisite: ME BD 449
ME BD 466 VIBRATIONS (3) Characteristics of dynamic systems with free or forced vibrations, both damped and undamped; includes matrix and/or finite element methods. Prerequisite: MATH 251, ME BD 443
ME BD 475 ENGINEERING PROPERTIES OF PLASTICS (3) An introduction to the structure property relationship of commercial plastics, property testing protocols, use of test data in design, overview of plastics processing and the effect of processing on properties. Prerequisite: ME BD 240, ME BD 445
ME BD 477 MATERIALS ENGINEERING APPLICATIONS OF SCANNING ELECTRON MICROCOPY (3) Engineering applications of sem with laboratory; metallography and materials surface analysis; fracture analysis; failure theories; electron probe microanalysis. Prerequisite: ME BD 446
ME BD 480 ENGINEERING DESIGN CONCEPTS (3) Engineering design and modelling, engineering economic analysis techniques, technical communication skills, project planning and design. Prerequisite: ME BD 241, ME BD 445, seventh-semester standing
ME BD 481 MECHANICAL DESIGN PROJECTS (3) Group or individual design projects in the areas of mechanical engineering. Prerequisite: ME BD 480, eighth-semester standing
ME BD 494 RESEARCH PROJECT (1–12)
ME BD 495 INTERNSHIP (1–18)
ME BD 496 INDEPENDENT STUDIES (1–18)
ME BD 497 SPECIAL TOPICS (1–9)

MECHANICAL ENGINEERING (M ENG)

Capital College

M ENG 312 ENGINEERING MECHANICS—DYNAMICS (2) Motion of particles; relative motion; translation; rotation; plane motion; kinematics; linkages; equation of motion; work; energy; impulse; momentum. Prerequisite: E MCH 011, MATH 140
M ENG 322 ENGINEERING THERMODYNAMICS AND HEAT TRANSFER (3) Introductory thermodynamics and heat transfer system analysis, control volume, conduction, convection, and radiation. Prerequisite: CHEM 012, CHEM 014, MATH 140
M ENG 497 SPECIAL TOPICS (1–9)

MECHANICAL ENGINEERING TECHNOLOGY (M E T)

Capital College

M E T 305 KINEMATICS AND DESIGN OF MACHINES (4) Analytical and graphical studies in the kinematics of mechanisms; design of machine elements for producing and transmitting power in machines. Prerequisite: E MCH 013
M E T 311 APPLIED THERMODYNAMICS (3) Basic thermodynamic concepts and definitions, first and second laws; properties of pure substances; cycle analysis; power generation; heat transfer. Prerequisite: CHEM 012, CHEM 014, MATH 140
M E T 312 THERMAL ENGINEERING A (3) Basic thermodynamic units, concepts, properties of ideal gases and vapors, first and second laws, gaseous mixtures, one-dimensional compressible flow. Prerequisite: CHEM 012, CHEM 014, MATH 140
M E T 315 MICROCOMPUTER APPLICATIONS (3) Microcomputer methods for analysis and design of engineering systems.
M E T 321 ANALYTICAL TECHNIQUES (2) A study of engineering methods of problem formulation and solution; includes differential methods, dimensional analysis, and graphical analysis. Prerequisite: E MCH 012, M E T 361, MATH 140 Concurrent: integral calculus
M E T 328 PROCESS DESIGN ENGINEERING (3) Introduction to process design for production applications from job shop to world-class manufacturing environments. Prerequisite: I E T 321
M E T 331 INSTRUMENTATION (2) Measuring system responses of first and second order instruments; fundamentals of mechanical measurements, including pressure, temperature, fluid flow, etc.
M E T 350 COMPUTER AIDED SOLID MODELING AND ANALYSIS (3) Basic techniques necessary to perform Computer Aided Design and Analysis in three dimensions for machine components.

M E T 361 ENGINEERING FLUID MECHANICS (3) Thermal and dynamic principles applied to fluid behavior, ideal, viscous, and compressible fluids under internal and external flow conditions. Prerequisite: E MCH 011 Concurrent: Chemistry, Physics, Calculus
M E T 397 SPECIAL TOPICS (1- 9)
M E T 401 ADVANCED KINEMATICS (3) Analysis and design of planar and space mechanisms using advanced techniques, including computers; robotics. Prerequisite: E MCH 012, M E T 315, M E T 321
M E T 402 HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS (3) The study of heating, ventilating, and air conditioning systems for buildings. Prerequisite: M E T 312
M E T 403 ADVANCED MECHANICAL DESIGN (3) Continuation of strength of materials and machine design, with emphasis on advanced methods of design and analysis of machine elements. Prerequisite: M E T 305
M E T 405 MECHANICAL ENGINEERING TECHNOLOGY LABORATORY B (2) Laboratory exercises in the areas of instrumentation, strength of materials, fluid flow, vibrations, thermodynamics, etc. Prerequisite: M E T 303, M E T 312, M E T 361
M E T 410 INTERNAL COMBUSTION ENGINE DESIGN (3) The effect of operation requirements on design and construction of internal combustion engines; study of support systems and emissions control. Prerequisite: M E T 312, M E T 413
M E T 411 HEAT TRANSFER (3) Basic principles of conduction, convection, and radiation with applications. Prerequisite: M E T 312, M E T 413
M E T 413 THERMAL ENGINEERING B (3) Applied thermodynamics of power cycles; refrigeration and air conditioning cycles; combustion; psychometrics; and gas mixtures. Prerequisite: M E T 312
M E T 417 FINITE ELEMENT ANALYSIS (3) Formulation and computer implementation of finite element models for solving problems in heat transfer, fluid flow, and solid mechanics. Prerequisite: M E T 305, M E T 315
M E T 420 SOLAR ENERGY (3) The basic fundamentals of the practical application of using solar energy for domestic hot water heating, building heating, etc. Prerequisite: M E T 312
M E T 422 ENERGY MANAGEMENT (3) Techniques for improving the efficiency of fuel usage in buildings, industries, and power plants are studied. Prerequisite: I E T 302, M E T 402, or M E T 435
M E T 433 COMPUTER-AIDED DESIGN (3) Study of the fundamentals of computer-aided design and manufacturing systems; hands-on exercises utilizing a microcomputer-based CAD/CAM system. Prerequisite: junior standing
M E T 434 AUTOMATIC CONTROLS (3) An introduction to basic automatic control theory, practical applications of automatic controls to typical industrial machinery, HVAC equipment, etc. Prerequisite: E MCH 012, M E T 321
M E T 435 BUILDING ENERGY SYSTEMS (3) Analysis and design of components and systems for building heating and cooling; emphasis on applying the thermal sciences. Prerequisite: M E T 312, M E T 361
M E T 441 VIBRATION ANALYSIS (4) Analysis of motion arising from lateral and torsional vibrations of systems; free and forced vibrations; damping; isolation; balancing. Prerequisite: E MCH 012, M E T 321
M E T 442 PROJECT DESIGN (4) Design of system or machine, including decision making, engineering analysis, layout, detail drawings, specifications, construction. Prerequisite: M E T 305, M E T 411, and senior standing
M E T 442P PROJECT DESIGN (1) Design of system or machine, including decision making, engineering analysis, layout, detail drawings, specifications, construction. Prerequisite: M E T 305, M E T 411, and senior standing
M E T 450 MANUFACTURING ENGINEERING (3) Design, analysis and operational issues related to improved productivity and efficiency in modern manufacturing systems. Prerequisite: M E T 328
M E T 497 SPECIAL TOPICS (1–9)

MECHANICAL ENGINEERING TECHNOLOGY (ME T)

College of Engineering

ME T 100 MECHANISMS (2) Motion in machine elements; strength and properties of materials; design of machine elements. Prerequisite: MCH T 111
ME T 105 KINEMATICS (3) Graphical/analytical studies of relative motions, instant centers, velocity/acceleration in plane motions, mechanisms, cams, gears, gear trains, flexible, and connectors. Prerequisite: EG T 101, EG T 102, MCH T 111
ME T 197 SPECIAL TOPICS (1–9)
ME T 206 DYNAMICS AND MACHINE ELEMENTS (3) Motion of particle; relative motion; kinetics of translation, rotation, work-energy; impulse-momentum. Graphical and analytical study of motion. Prerequisite: EG T 101, ET 002, MCH T 111 Concurrent: CMPSC 101
ME T 207 HEAT TRANSFER (3) Basic principles of conduction, convection, and radiation, emphasizing practical applications.
ME T 210 PRODUCT DESIGN (3) Design of machine elements including levels, bearings, shafts, clutches, springs, and gears; selection of ball bearings and belts; design of small mechanical devices. Prerequisite: MCH T 213, ME T 105
ME T 210W PRODUCT DESIGN (3) Design machine elements including bearings, springs, levers, shafts, gears, belts, and small mechanical devices; writing skills and computer applications. Prerequisite: M E T 206, MCH T 213; or EMET 322

ME T 281 ELEMENTARY THERMO- AND FLUID DYNAMICS (4) Basic problems in compressible fluid flow. Laws of dynamics and thermodynamics, mechanical properties of fluids, elementary heat transfer. Prerequisite: or concurrent: MATH 083, PHYS 150
ME T 296 INDEPENDENT STUDIES (1–18)
ME T 297, 298 SPECIAL TOPICS (1–9)

MECHANICAL ENGINEERING TECHNOLOGY (METBD)

Penn State Erie, The Behrend College

METBD 050 COMPUTER APPLICATIONS FOR TECHNOLOGISTS (3) Programming spreadsheets, data bases and presentation software for solutions of technical problems; introduction to languages allowing creation of program macros.
METBD 097 SPECIAL TOPICS (1–9)
METBD 110 INTRODUCTION TO GRAPHICS AND SOLID MODELING (3) Development of visualization skills; introduction to parametric solids modeling techniques with constrained and unconstrained geometry, and assemblies.
METBD 111 APPLIED SOLIDS MODELING (3) Creation of working drawings from solid models; dimensioning, GD&T, fastener, weld and finish symbols, layouts and bill of materials. Prerequisite: METBD 110
METBD 112 GEOMETRIC DIMENSIONING AND TOLERANCING (3) Study of methods of geometric dimensioning and tolerancing used in technical graphics; CAD drawing applications are used to strengthen proficiency. Prerequisite: METBD 111
METBD 197 SPECIAL TOPICS (1–9)
METBD 296 INDEPENDENT STUDIES (1–18)
METBD 297 SPECIAL TOPICS (1–9)
METBD 301 VECTOR MECHANICS FOR TECHNOLOGISTS (3) Vector topics for statics and dynamics. Prerequisite: E MCH 011 or MCH T 111; E MCH 012 or ME T 206
METBD 306 COMPUTER-AIDED DESIGN (3) Computer-aided drafting and design; computer software solutions to mechanical engineering technology design problems. Prerequisite: CMPSC 101, CMPSC 201C, CMPSC 201F, or METBD 050; EG T 201 or METBD 111
METBD 307 COMPUTER-AIDED DESIGN (3) Computer-aided drafting and design; computer software solutions to plastics engineering technology design problems. Prerequisite: METBD 111; METBD 050 or PL ET 050
METBD 317 FINITE ELEMENT ANALYSIS FOR PLASTICS DESIGN (3) Solutions of advanced engineering problems using finite element and finite difference techniques; advanced topics in computer-aided manufacturing; problems in optimization and design. Prerequisite: METBD 306, PL ET 340. PREREQUISITE OR CONCURRENT: PL ET 350
METBD 320 STRENGTH OF MATERIALS (3) Principles of stress and strain in 3D, indeterminate structures, failure theory, fatigue and fracture mechanics. Prerequisite: E MCH 013 or MCH T 213; MCH T 214
METBD 330 THERMODYNAMICS (3) Introduction for technologists to the basic concepts and applications of thermodynamics. Prerequisite: PHYS 151, PHYS 212, or PHYS 251. Prerequisite or concurrent: CHEM 012, CHEM 014; MATH 141 or MTHBD 210
METBD 331 HEAT TRANSFER (4) Introduction for technologists to the basic concepts and applications of heat transfer. Includes a thermodynamics and heat transfer laboratory. Prerequisite: M E 030 or METBD 330. Prerequisite or concurrent: METBD 341
METBD 331W HEAT TRANSFER (4) Introduction for technologists to the basic concepts and applications of heat transfer. Includes a thermodynamics and heat transfer laboratory. Prerequisite: M E 330 or METBD 330. Prerequisite or concurrent: METBD 341
METBD 335 THERMAL SCIENCE LAB (2) Principles of experimentation, acquisition, and analysis of data in the areas of thermodynamics and heat transfer for technologists. Prerequisite: or concurrent: METBD 331
METBD 341 MECHANICAL MEASUREMENTS AND INSTRUMENTATION (3) Measurement concepts, transducers, electronic-aided measurement, mechanical and electrical measurements. Intended for mechanical engineering technologists. Prerequisite: MCH T 214; PHYS 151, PHYS 212, or PHYS 251; EE T 101 or EETBD 100; E E 220 or EE T 109
METBD 350 FINITE ELEMENT ANALYSIS APPLICATIONS I (3) Solutions of advanced engineering design problems using finite elements. Intended for engineering technologists. Prerequisite: OR CONCURRENT: METBD 306, METBD 320
METBD 360 DESIGN OF MACHINE ELEMENTS (3) Design of machine elements and connections, stress, analysis and modes of failure. Prerequisite: METBD 320
METBD 397 SPECIAL TOPICS (1–9)
METBD 410 RAPID PROTOTYPING (3) Introduction to the production of prototypes directly from computer models. Prerequisite: IE T 216, METBD 306
METBD 430 INDUSTRIAL HYDRAULICS (3) Principles of fluid flow, hydraulic components, and hydraulic circuits having application to industry. Prerequisite: M E 030 or METBD 330; METBD 331
METBD 440 VIBRATIONS FOR TECHNOLOGISTS (3) Principles of basic vibration theory, vibration measurement, data acquisition and analysis, and the effective presentation of vibration data. Prerequisite: E MCH 012 or ME T 206; MATH 231 and MATH 250 or MTHBD 211; METBD 341; METBD 350

METBD 450 FINITE ELEMENT ANALYSIS APPLICATIONS II (3) Solutions of advanced engineering design problems using finite element methods. Prerequisite: METBD 350
METBD 451 FINITE ELEMENT DYNAMIC APPLICATIONS (3) Dynamic structural analysis using finite element methods for modeling problems in modal, harmonically forced, and general transient analysis. Prerequisite: METBD 350, METBD 440
METBD 452 FINITE ELEMENT HEAT TRANSFER APPLICATIONS (3) Heat transfer analysis using finite element methods for modeling steady- state and transient problem in conduction, convection, and radiation. Prerequisite: METBD 331, METBD 350
METBD 461 ADVANCED MACHINE DESIGN (3) Stress analysis, material selection, design of machine elements, design of connections, and computer-aided design. Prerequisite: METBD 350, ME T 210
METBD 470 MATERIALS ENGINEERING (3) Study of material selection, material properties, material test methods, and special topics. Prerequisite: CHEM 012, CHEM 014, METBD 320
METBD 480 SENIOR CAPSTONE (1) Career and professional topics; development of year-long senior project with industry. Prerequisite: M E 030 or METBD 330; METBD 350
METBD 490 SENIOR INDUSTRIAL PROJECT (3) Individual or group design projects in mechanical design or materials. Prerequisite: METBD 450, METBD 470, METBD 480
METBD 495 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica or internships. Written and oral critique of activity required. Prerequisite: PRIOR APPROVAL OF PROPOSED ASSIGNMENT BY INSTRUCTOR
METBD 496 INDEPENDENT STUDIES (1–18)
METBD 497 SPECIAL TOPICS (1–9)

MECHANICAL TECHNOLOGY (MCH T)

College of Engineering
MCH T 111 MECHANICS FOR TECHNOLOGY: STATICS (3) Forces; moments; resultants; two- and three-dimensional equilibrium of force systems; friction; centroids and moments of inertial of areas. Prerequisite: ET 002, MATH 081
MCH T 212 INTRODUCTION TO DYNAMICS (3) Absolute and relative motion related to particles and simple linkages. Force- mass-acceleration, work-energy, and impulse-momentum solution techniques. Prerequisite: MCH T 111. Prerequisite or concurrent: MATH 083
MCH T 213 STRENGTH AND PROPERTIES OF MATERIALS (3) Axial stress and strain; shear; torsion; beam stresses and deflections; combined axial and bending stresses; columns, ductility, resilience, and toughness. Prerequisite: MATH 082, MCH T 111
MCH T 214 STRENGTH AND PROPERTIES OF MATERIALS LABORATORY (1) Measurement of mechanical properties of materials; structural testing, data acquisition and analysis; technical laboratory report writing. Concurrent: MCH T 213
MCH T 296 INDEPENDENT STUDIES (1–18)

MEDIEVAL STUDIES (MEDVL)

College of the Liberal Arts
MEDVL 083S (GH) FIRST-YEAR SEMINAR IN MEDIEVAL STUDIES (3) Critical approaches to the dimensions and directions in Medieval Studies.
MEDVL 107 (GH) (HIST) MEDIEVAL EUROPE (3) Rise and development of the civilization of medieval Europe from the decline of Rome to 1500.
MEDVL 108 (GH) MEDIEVAL CIVILIZATION (3) An interdisciplinary introduction to literature, art, and thought of the Middle Ages.
MEDVL 187 MEDIEVAL STUDIES FRESHMAN SEMINAR (3) The meaning and advantages of a Liberal Arts education in context of a specific discipline. Prerequisite: first-semester standing and enrollment in the College of the Liberal Arts
MEDVL 197, 497 SPECIAL TOPICS (1–9)
MEDVL 199, 299, 399, 499 (GI) FOREIGN STUDIES (1–12)
MEDVL 294, 494 RESEARCH PROJECT (1–12)
MEDVL 395, 495 INTERNSHIP (1–18)
MEDVL 411 (HIST) MEDIEVAL BRITAIN (3) Political, cultural, and economic history of Britain from circa 400 to 1485 with an emphasis on the kingdom of England. Prerequisite: 6 credits in European history or medieval studies
MEDVL 413 (HIST) MEDIEVAL CELTIC STUDIES (3) Celtic civilization from antiquity to the end of the middle ages. Prerequisite: 3 credits in medieval studies, or in language, literature, or European history of the medieval period
MEDVL 496 INDEPENDENT STUDIES (1–18)

METALS SCIENCE AND ENGINEERING (METAL)

College of Earth and Mineral Sciences
METAL 497 SPECIAL TOPICS (1–9)
NOTE: Courses in the use of X-ray diffraction, electron microscopy, and spectroscopy in metallurgical studies are listed under MATERIALS SCIENCE and ENGINEERING.

METEOROLOGY (METEO)

College of Earth and Mineral Sciences

METEO 002 (GN) OUR CHANGING ATMOSPHERE: PERSONAL AND SOCIETAL CONSEQUENCES (3) A survey of meteorology emphasizing how the nature of our lives, individually/ societally, depends upon atmospheric structure, quality, and processes.

METEO 003 (GN) INTRODUCTORY METEOROLOGY (3) Nontechnical treatment of fundamentals of modern meteorology and the effects of weather and climate. A student who took METEO 002 may take the laboratory part of this course for 1 credit only.

METEO 003L (GN) INTRODUCTORY METEOROLOGY (2) Nontechnical treatment of fundamentals of modern meteorology; effect of weather and climate on man and his activities. A student who took METEO 002 may take the laboratory part of this course for 1 credit only.

METEO 003P (GN) INTRODUCTORY METEOROLOGY (1) Nontechnical treatment of fundamentals of modern meteorology; effect of weather and climate on man and his activities. A student who took METEO 002 may take the laboratory part of this course for 1 credit only.

METEO 022 THE OCEANS (2) A survey of oceanic properties and processes, with emphasis on the mechanisms of tides, waves, and ocean currents.

METEO 101 (GN) UNDERSTANDING WEATHER FORECASTING (3) Fundamental principles of synoptic and physical meteorology, satellite and radar imagery, and data analysis in the setting of mid-latitude weather forecasting.

METEO 200A INTRODUCTION TO WEATHER ANALYSIS I (1.5) Introduction to the collection, display, and application of weather observations used by the operational meteorologist. Students who have passed METEO 201 may not schedule this course for credit.

METEO 200B INTRODUCTION TO WEATHER ANALYSIS II (1.5) Introduction to the collection, display, and application of numerical weather forecasts used by the operational meteorologist. Students who have passed MET EO 201 may not schedule this course for credit. Prerequisite: METEO 200A

METEO 201 INTRODUCTION TO WEATHER ANALYSIS (3) Introduction to the collection, display, and application of weather observations and numerical forecasts used by the operational meteorologists. Students who have passed both METEO 200A and 200B may not schedule this course for credit.

METEO 241 FUNDAMENTALS OF TROPICAL FORECASTING (3) Applying atmospheric principles to the tropics, with an emphasis on the development, structure, prediction and destructive impact of hurricanes. Prerequisite: METEO 101

METEO 296 INDEPENDENT STUDIES (1–18)

METEO 297 SPECIAL TOPICS (1–9)

METEO 300 SURVEY OF ATMOSPHERIC SCIENCE (3) Survey of atmospheric processes ranging from global to microscale. Prerequisite: or concurrent: MATH 230 or MATH 231; PHYS 211

METEO 361 FUNDAMENTALS OF MESOSCALE WEATHER FORECASTING (3) Applying atmospheric principles to small-scale weather systems, with an emphasis on the conceptual modeling and short-range prediction of severe thunderstorms. Prerequisite: METEO 101

METEO 410 ADVANCED TOPICS IN WEATHER FORECASTING (3) Exploring highly specialized topics and techniques in weather forecasting that span from mesoscale to planetary spatial scales and short-term to long- range time scales. Prerequisite: METEO 101; METEO 241 or METEO 361

METEO 411 SYNOPTIC METEOROLOGY LABORATORY (4) Techniques of analyzing synoptic scale weather situations; introduction to weather forecasting. Prerequisite: METEO 101 or METEO 200A and METEO 200B or METEO 201; MATH 230 or MATH 231 Prerequisite or concurrent: METEO 421 and METEO 431

METEO 412 SYNOPTIC APPLICATIONS OF DYNAMIC METEOROLOGY (4) Study of development and structure of large-scale weather systems and fronts. Prerequisite: METEO 411; METEO 422

METEO 413 MAP ANALYSIS (3) Analysis of actual surface weather observations, with emphasis on the Norwegian cyclone model, missing or bad data, and mesoscale phenomena. Prerequisite: METEO 411

METEO 414 MESOSCALE METEOROLOGY (4) A survey of conceptual models and analysis techniques for mesoscale atmospheric features. Prerequisite: METEO 411

METEO 415 FORECASTING PRACTICUM (3) Modern techniques in weather analysis and forecasting. Prerequisite: or concurrent: METEO 414

METEO 416 ADVANCED FORECASTING (3) Competitive, simulated, operational, real-time forecasting is covered. Prerequisite: METEO 414, METEO 415

METEO 417 HYDROMETEOROLOGY (3) Theory and application of precipitation meteorology, hydrology, and regional forecast planning; control of the hydrometeorological system and its societal effects. Prerequisite: METEO 414

METEO 418W TOPICS IN MESOSCALE METEOROLOGY (3) Topics in mesoscale meteorology will be investigated in an independent study environment through computer-based modules, papers, and semester project. Prerequisite: METEO 414

METEO 421 DYNAMIC METEOROLOGY I (4) Kinematics, balanced and unbalanced flows, vorticity and potential vorticity, and introduction to the boundary layer and numerical weather prediction. Prerequisite: MATH 230 or MATH 231; METEO 300 prerequisite or concurrent: METEO 431, PHYS 212

METEO 422 DYNAMIC METEOROLOGY II (4) Generalized vertical coordinate systems, vorticity and theory applications, conservation principles and energetics, quasi-geostrophic processes, boundary layer dynamics. Prerequisite: METEO 421

METEO 431 ATMOSPHERIC THERMODYNAMICS (3) Classical thermodynamics applied to both the dry and the moist atmosphere. Prerequisite: PHYS 212

METEO 433 (E E) FUNDAMENTALS OF REMOTE SENSING SYSTEMS (3) The review of fundamental physical properties leads into discussions of various techniques, including imaging, spectroscopy, radiometry, and active sensing. Prerequisite: E E 330 or METEO 436

METEO 434 RADAR METEOROLOGY (3) Fundamental operating principles of radars, with application to observation of meteorological phenomena. Prerequisite: METEO 437 Concurrent: METEO 414

METEO 436 ATMOSPHERIC PHYSICS I (3) Elements of earth-sun geometry, radiative transfer, photochemistry, remote sensing of the atmosphere, physical climatology, climate forcing. Prerequisite: or concurrent: METEO 431

METEO 437 ATMOSPHERIC PHYSICS II (3) Properties of aerosols and clouds, cloud nucleation and precipitation processes, atmospheric electricity, cloud and precipitation chemistry, biogeochemical cycles. Prerequisite: METEO 431

METEO 445 LABORATORY IN ATMOSPHERIC PHYSICS I (1) Measurement practices, data analysis and management, radiometry lidars and radars, trace gas measurements. Prerequisite: or concurrent: METEO 436

METEO 446 LABORATORY IN ATMOSPHERIC PHYSICS II (1) Experimental practices in cloud and aerosol physics, atmospheric electricity, atmospheric chemistry, radar meteorology. Prerequisite: or concurrent: METEO 437

METEO 448 STORMWATER HYDROLOGY (3) Relationship between surface runoff, rainfall and water chemistry during rainfall events for the purpose of assessing urbanization, non-point source contamination.

METEO 451 ELEMENTS OF PHYSICAL OCEANOGRAPHY (3) Air-ocean interactions and their effects on properties of sea water, state of the sea surface, and current systems. Prerequisite: MATH 231, MATH 251; PHYS 211

METEO 452 TROPICAL METEOROLOGY (3) Atmospheric processes in the tropics; mass, heat, energy, momentum, and water vapor budgets, cumulus convection, hurricanes and other disturbances. Prerequisite: METEO 411, METEO 421

METEO 454 INTRODUCTION TO MICROMETEOROLOGY (3) Physical processes and their measurement in the lowest layers of the atmosphere; application to hydrology, plant systems, and air pollution. Prerequisite: METEO 421 and METEO 431 or EGEE 301

METEO 455 ATMOSPHERIC DISPERSION (3) The basic principles of atmospheric flow, introduction to the modeling of turbulent diffusion, and the use of EPA dispersion models. Prerequisite: EGEE 301, C E 360, M E 033, METEO 454, METEO 456, or F SC 430

METEO 456 ENVIRONMENTAL METEOROLOGY (3) Atmospheric processes and phenomena relevant to the environmental sciences and engineering, including boundary layer meteorology and air pollution dispersion. Prerequisite: C E 360, MATSC 401

METEO 465 MIDDLE ATMOSPHERE METEOROLOGY (3) A topical survey of physical, chemical, and dynamical processes at work in the stratosphere and mesosphere (middle atmosphere). Prerequisite: METEO 421, METEO 431

METEO 466 PLANETARY ATMOSPHERES (3) A survey of planetary atmospheres and the chemical and physical processes by which they form and evolve. Prerequisite: MATH 141, PHYS 211

METEO 470 CLIMATE DYNAMICS (3) The fundamental principles that govern Earth's climate and their relevance to past and future climate change. Prerequisite: METEO 300, METEO 421, METEO 431 Concurrent: METEO 436

METEO 471W OBSERVING METEOROLOGICAL PHENOMENA (3) Teaching the observational and interpretative skills needed to read the sky. Prerequisite: METEO 421. Prerequisite or concurrent: METEO 436

METEO 472W TOPICS IN CLIMATOLOGY (3) Selected topics of current interest in physical and dynamic climatology and climatic change. Concurrent: METEO 300

METEO 473 APPLICATION OF COMPUTERS TO METEOROLOGY (3) Application of statistical and numerical methods to practical problems in meteorology. Prerequisite: CMPSC 101, CMPSC 201C, or CMPSC 201F

METEO 474 COMPUTER METHODS OF METEOROLOGICAL ANALYSIS AND FORECASTING (3) Distribution of scalars and vectors; sampling; regression and correlation in two and three dimensions; time series, statistical forecasting; forecast verification. Prerequisite: STAT 301 or STAT 401 or ENNEC 472

METEO 475W (GEOSC) GLOBAL BIOGEOCHEMICAL CYCLES (3) The study of Earth's major global biogeochemical cycles (carbon, oxygen, nitrogen, phosphorus, and sulfur) in the context of the climate system. Prerequisite: MATH 110 and MATH 111, or MATH 140 and MATH 141, and CHEM 012

METEO 476 ATMOSPHERIC NATURAL DISASTERS SEMINAR (2) Survey of naturally occurring, catastrophic meteorological events, including severe thunderstorms, tornadoes, aviation hazards, floods, and severe winter storms. Prerequisite: METEO 411 Concurrent: METEO 414

METEO 480W UNDERGRADUATE RESEARCH (3) A research thesis will be prepared. A written and oral presentation required. Prerequisite: junior or senior standing as a Meteorology Major

METEO 481 WEATHER COMMUNICATIONS I (3) Multi-instructor weather communications survey including forecasting, science teaching and writing, television and radio broadcasting, climate studies, forensics, industrial applications. Prerequisite: METEO 201 or METEO 101

METEO 482 WEATHER COMMUNICATIONS II (3) Multi-instructor workshop designed to mimic real-life applications of weather communications in industry, broadcasting, the courtroom, and the classroom. Prerequisite: METEO 481

METEO 483 WEATHER COMMUNICATIONS III (3) Individualized course designed for in-depth study of weather communications in industry, broadcasting, the courtroom and/or the classroom. Prerequisite: METEO 411, METEO 482
METEO 484 WEATHER COMMUNICATIONS APPRENTICESHIP (3) Mentor-led course that focuses on a specific issue of problem in weather communications related to broadcasting, climate or industry. Prerequisite: METEO 481, METEO 482 and METEO 483
METEO 485 NATIONAL WEATHER SERVICE OPERATIONS (2–3 per semester) Joint instruction with lead personnel from the State College National Weather Service Office on a variety of operational weather topics. Prerequisite: prerequisite or concurrent: METEO 481, METEO 415
METEO 491 JOINT NATIONAL WEATHER SERVICE MAP DISCUSSION (1) Students evaluate and discuss real-time, regional and local weather conditions and forecasts with University instructors and National Weather Service forecasters. Prerequisite: METEO 411, METEO 415 Concurrent: METEO 414
METEO 496 INDEPENDENT STUDIES (1–18)
METEO 497, 498 SPECIAL TOPICS (1–9)

MICROBIOLOGY (MICRB)

Eberly College of Science

*MICRB 106 (GN) ELEMENTARY MICROBIOLOGY (3) Importance of microorganisms in health and disease, agriculture, and industry; descriptive course for students not planning advanced study in microbiology.
*MICRB 107 (GN) ELEMENTARY MICROBIOLOGY LABORATORY (1) Selected techniques used to observe, identify and count bacteria; effects of chemical and physical agents on microorganisms. Prerequisite: or concurrent: MICRB 106
MICRB 150 INTRODUCTORY MEDICAL LABORATORY TECHNOLOGY (4) Introduction to basic principles and procedures of clinical laboratory work. Practicum emphasizes proper collection, handling, and preparation of biological samples. Prerequisite: admission to 2-MLT program
MICRB 151A SEMINAR AND PRACTICUM FOR MEDICAL LABORATORY TECHNICIANS—CLINICAL CHE MISTRY (7) Basic principles and procedures for measuring chemical components of blood and other body fluids. Prerequisite: BIOL 141, CHEM 034, MICRB 150, MICRB 201, MICRB 202
MICRB 151C SEMINAR AND PRACTICUM FOR MEDICAL LABORATORY TECHNICIANS—HEMATOLOGY (6) Red and white blood cell identification and enumeration. Related procedures for diagnosing normal or disease states. Prerequisite: BIOL 141, CHEM 034, MICRB 150, MICRB 201, MICRB 202
MICRB 151D SEMINAR AND PRACTICUM FOR MEDICAL LABORATORY TECHNICIANS—IMMUNOHEMATOLOGY (4) Immunologic considerations necessary for the transfusion of blood and blood products. Prerequisite: BIOL 141, CHEM 034, MICRB 150, MICRB 201, MICRB 202
MICRB 151E SEMINAR AND PRACTICUM FOR MEDICAL LABORATORY TECHNICIANS—URINALYSIS (2) Identification of cellular and crystalline urinary sediments. Qualitative chemical analysis of urine. Prerequisite: BIOL 141, CHEM 034, MICRB 150, MICRB 201, MICRB 202
MICRB 151F SEMINAR AND PRACTICUM FOR MEDICAL LABORATORY TECHNICIANS—IMMUNOLOGY/ SER OLOGY (2) Antigen-antibody interactions of diagnostic importance; methods used to identify and quantify antigen-antibody complexes. Prerequisite: BIOL 141, CHEM 034, MICRB 150, MICRB 201, MICRB 202
MICRB 151W SEMINAR AND PRACTICUM FOR MEDICAL LABORATORY TECHNICIANS—CLINICAL MIC ROBIOLOGY (6) Properties of normal and abnormal human microbial flora and procedures for their identification. Prerequisite: BIOL 141, CHEM 034, MICRB 150, MICRB 201, MICRB 202
MICRB 199 (GI) FOREIGN STUDIES (1–12)
MICRB 201 INTRODUCTORY MICROBIOLOGY (3) Elementary principles of microbial and viral interrelationships, morphology, and physiology; relation to food, water, soil, industry, and disease processes.Designed for students in technical majors.
MICRB 202 INTRODUCTORY MICROBIOLOGY LABORATORY (2) Qualitative and quantitative techniques with regard to recognition of bacteria and their processes on a microscopic, colonial, and physiological basis. Prerequisite: CHEM 012. Prerequisite or concurrent: MICRB 201
MICRB 251 (B M B) MOLECULAR AND CELL BIOLOGY I (3) Biomolecules, genetic mechanisms, organization of cells and their organelles, DNA replication, protein synthesis, membranes, the cell nucleus, energy conversion. Prerequisite: CHEM 013
MICRB 252 (B M B) MOLECULAR AND CELL BIOLOGY II (3) Continuation of BIOCH/B M B/MICRB 251: cytoskeleton, cell growth, division, adhesion, signalling, germ cells, differentiation, immune system, nervous system, plant cells. Prerequisite: MICRB 251
MICRB 297 SPECIAL TOPICS (1–9)
MICRB 342 (B M B) LABORATORY IN PROTEINS, NUCLEIC ACIDS, AND MOLECULAR CLONING (3) Laboratory in enzyme purifications and assay techniques; nucleic acid isolation and characterization, including plasmid preparation. Prerequisite: B M B 251, BIOL 230W, or MICRB 201; CHEM 034 or CHEM 038. Prerequisite or concurrent: B M B 211 or B M B 401
MICRB 399 (GI) FOREIGN STUDIES (1–12)
MICRB 400 INTRODUCTORY ENVIRONMENTAL MICROBIOLOGY (2) Elementary ecological relationships of microorganisms in the biosphere; role of bacteria in water pollution and purification. This course should not be scheduled by students who have taken Micrb. 201 or 202. Prerequisite: CHEM 034

MICRB 401 MICROBIAL PHYSIOLOGY AND STRUCTURE (3) Physiology and structure of bacteria important in microbiological research. Designed for science majors. Prerequisite: CHEM 034 or CHEM 038; MICRB 201, MICRB 202

MICRB 405A SEMINAR AND PRACTICUM IN MEDICAL TECHNOLOGY (8) Chemistry. Fundamental principles and the quantitative measurement of chemical components in the blood and other body fluids.

MICRB 405B SEMINAR AND PRACTICUM IN MEDICAL TECHNOLOGY (1) Urinalysis. Identification of cellular and noncellular urinary sediments. Qualitative chemical analysis of urine.

MICRB 405C SEMINAR AND PRACTICUM IN MEDICAL TECHNOLOGY (6) Hematology. Principles of red and white blood cell development. Identification of normal and pathological conditions.

MICRB 405D SEMINAR AND PRACTICUM IN MEDICAL TECHNOLOGY (5) Immunohematology. Immunologic and genetic principles governing the transfusion of blood and blood products.

MICRB 405E SEMINAR AND PRACTICUM IN MEDICAL TECHNOLOGY (7) Microbiology. Identification of normal and abnormal microbial flora from various locations on and within the human body.

MICRB 405F SEMINAR AND PRACTICUM IN MEDICAL TECHNOLOGY (3) Serology-Immunology. Immunological principles and their application in the identification of present or past disease states of the human.

MICRB 408 LABORATORY INSTRUCTIONAL PRACTICE (1–2) Participation in the instruction of undergraduate laboratory courses, including classroom preparation; discussion of principles and objectives of each exercise. Prerequisite: 8 CREDITS IN MICROBIOLOGY AND PERMISSION OF DEPARTMENT HEAD

MICRB 410 PRINCIPLES OF IMMUNOLOGY (3) Theories of immunity; focuses on the basis for the acquired immune response at the organ, cell, and molecular levels. Prerequisite: B M B 251, MICRB 201, or MICRB 251

MICRB 411 SURVEY OF MICROBIOLOGY LITERATURE (1 per semester) An introduction to readings and oral presentations in microbiology. Prerequisite: 8 credits in microbiology courses

MICRB 412 MEDICAL MICROBIOLOGY (3) Characteristics, methods of identification, and pathogenesis of bacteria that cause human disease; principles of disease dynamics and control. Prerequisite: MICRB 201

MICRB 413 MICROBIAL DIVERSITY (2) survey of microorganisms having special adaptive mechanisms for life in common and unique environments; topics include ecology, evolution, and bioremedia- tion. Prerequisite: MICRB 201, MICRB 202

MICRB 415 GENERAL VIROLOGY: BACTERIAL AND ANIMAL VIRUSES (3) The interaction of different types of viruses with bacterial and animal cells, including mechanisms of infection and viral synthesis. Prerequisite: B M B 251, B M B 252 or BIOL 110, BIOL 230W; MICRB 201

MICRB 416 (BIOTC) MICROBIAL BIOTECHNOLOGY (2) Fundamentals of applied biotechnology; the use of microorganisms in the synthesis of biologically-important and industrially-useful products. Prerequisite: MICRB 201, MICRB 202; B M B 342 or MICRB 342

MICRB 421W LABORATORY OF GENERAL AND APPLIED MICROBIOLOGY (3) Laboratory exercises demonstrating fundamental techniques and principles of experimentation of general and applied microbiology. Prerequisite: MICRB 201, MICRB 202

MICRB 422 MEDICAL MICROBIOLOGY LABORATORY (2) Laboratory exercises demonstrating properties and classification of medically important microorganisms and techniques used in their identification. Prerequisite: MICRB 202 Concurrent: MICRB 412

MICRB 432 (B M B;V SC) ADVANCED IMMUNOLOGY: SIGNALING IN THE IMMUNE SYSTEM (3) The study of signaling pathways that regulate the immune response. Prerequisite: B M B 400, MICRB 410

MICRB 435 (B M B;V SC) VIRAL PATHOGENSIS (2) A study of the molecular, immunological and pathological aspects of viral diseases as well as laboratory methods of diagnosis. Prerequisite: MICRB 201; B M B 251 and B M B 252 or BIOL 110 and BIOL 230W

MICRB 447 LABORATORY IN MOLECULAR IMMUNOLOGY (1) Laboratory in molecular techniques to assay antigens, antibodies, and receptor sites. Prerequisite: MICRB 410

MICRB 450 (B M B) MICROBIAL/MOLECULAR GENETICS (2) Genetic phenomena, with emphasis on molecular mechanisms: gene transfer, recombination, gene conversion, gene fusion, suppression, transposons. Prerequisite: BIOL 222, MICRB 201

MICRB 460 (B M B) CELL GROWTH AND DIFFERENTIATION (2) Mechanisms and regulation of protein trafficing and organelle biosynthesis, cell signalling, cell cycle control, and cell development. Prerequisite: B M B 252

MICRB 480 (B M B) TUMOR VIRUSES AND ONCOGENES (3) Oncogenes, DNA and RNA tumor viruses, and relevant experimental techniques with emphasis on molecular basis of carcinogenesis and gene regulation. Prerequisite: or concurrent: MICRB 415, MICRB 435, or MICRB 460

MICRB 496 INDEPENDENT STUDIES (1–18)

MICRB 497 SPECIAL TOPICS (1–9)

MICRB 498 SPECIAL TOPICS (1–9 per semester)

MICRB 499 (GI) FOREIGN STUDIES (1–12)

(*) Students must take a combination of MICRB 106 GN and 107 GN to receive General Education credit in biology.

MINERAL ENGINEERING (MIN E)

College of Earth and Mineral Sciences

MIN E 297 SPECIAL TOPICS (1–9)

MIN E 415 MANAGEMENT IN THE MINERAL INDUSTRIES FOR ENVIRONMENTAL, LEGAL, AND HEALTH AND SAFETY PROBLEMS (3) Mineral industries management and labor structure analyzed, with emphasis on environmental, health and safety, and legal aspects. Prerequisite: sixth-semester standing

MIN E 471 AGGREGATES PRODUCTION (3) Design and analysis of quarries, sand and gravel pits, and ancillary operations. Prerequisite: sixth-semester standing

MIN E 496 INDEPENDENT STUDIES (1–18)

MIN E 497 SPECIAL TOPICS (1–9)

MINERAL PROCESSING (MN PR)

College of Earth and Mineral Sciences

MN PR 301 ELEMENTS OF MINERAL PROCESSING (3) Introduction to mineral process engineering. Sampling, sizing, comminution, physical and chemical processes, applications to industrial practice. Pollution control. Prerequisite: CHEM 012 OR CHEM 017; MATH 141

MN PR 401 MINERAL PROCESS ENGINEERING (3) Unit operations for processing particulate materials: comminution, screening, classification, slurry pumping, thickening, filtration, etc.; application to mineral processing plant design. Prerequisite: MN PR 301, MATH 250 or MATH 251

MN PR 410 INTRODUCTION TO QUANTITATIVE MINERAL PROCESSING ENGINEERING ANALYSIS (3) This course examines the use of quantitative engineering techniques such as simulation, optimization, parameter estimation, etc., to calculate the expectations of mineral processing circuitry. Prerequisite: MN PR 301, MN PR 401

MN PR 413 MINERAL PROCESSING LABORATORY (1) A laboratory study of the chemical and physical principles involved in practical mineral processing operations. Prerequisite: or concurrent: MN PR 301

MN PR 421 PARTICLE TECHNOLOGY LABORATORY (1–3) Particle sizing techniques used in mineral separations. Sampling, sieving, perturbation, adsorption, microscopic methods. Separations based on size, shape, density, paramagnetism. Prerequisite: MATH 250 or MATH 251; PHYS 212

MN PR 424 COAL PREPARATION (3) Unit operations, flowsheets, and testing methods used in preparation of coal. Prerequisite: MN PR 301

MN PR 425 INTERFACIAL PHENOMENA AND FLOTATION (3) Surface and interfacial phenomena related to flotation agglomeration, flocculation, and dispersion of particles. Application to mineral separation and related processes. Prerequisite: EGEE 301; MATH 250 or MATH 251; MN PR 301

MN PR 426 (MATSE) AQUEOUS PROCESSING (3) A study of the chemical and engineering principles pertinent to metal processing in aqueous systems: hydrometallurgical extraction, plating, materials preparation. Prerequisite: EGEE 301 or MATSE 401

MN PR 451 SENIOR PROJECTS (1–6) Independent research and/or design projects under the supervision of the mineral processing faculty. Prerequisite: seventh-semester standing

MN PR 496 INDEPENDENT STUDIES (1–18)

MN PR 497 SPECIAL TOPICS (1–9)

MINING (MNG)

College of Earth and Mineral Sciences

MNG 023MINERAL LAND AND MINE SURVEYING (2) Surveying theory and practice applied to mineral lands and mines, traversing, leveling, mapping, underground surveying, microcomputer drafting and graphics. Prerequisite: E G 010; 1/2 UNIT OF SECONDARY SCHOOL TRIGONOMETRY

MNG 030 INTRODUCTION TO MINING ENGINEERING (2) Examination, development, and exploitation of mineral deposits; mining methods; unit operations; mining equipment; fundamentals of explosives.

MNG 400 MINING AND OUR ENVIRONMENT (3) For nonmining students. Nontechnical treatment of mining methods, practices, and role in today's civilization; socioeconomic and environmental problems.

MNG 401 INTRODUCTION TO MINING OPERATIONS (1) An introduction to underground and surface mining methods; selection of extraction equipment; relevant auxiliary operations. Not intended for Mining Engineering majors. Prerequisite: E MCH 011

MNG 402 MINE PLANT ENGINEERING (3) Theory and concepts of electrical power systems and loads in mining and similar industrial applications; drive systems for materials handling. Prerequisite: PHYS 212

MNG 403 MINE POWER SYSTEM DESIGN (3) Mine power system arrangements; design and specification of components and equipment. Prerequisite: MNG 402 or E E 220 or E E 365

MNG 404 MINE MATERIALS HANDLING SYSTEMS (2) Analysis and design of materials-handling systems in mining, such as belt conveyors, locomotives, and hoisting. Prerequisite: MNG 402

MNG 410 UNDERGROUND COAL EXTRACTION (2) Underground coal-mine design; extraction techniques; description of the various auxiliary operations as they relate to the mining methods. Prerequisite: MNG 404, MNG 422, MNG 431

MNG 411 MINE SYSTEMS ENGINEERING (2) Applied operations research and systems methods for decision making in mine operations; time and systems studies to improve productivity. Prerequisite: MNG 404

MNG 412 MINERAL PROPERTY EVALUATION (3) Ore reserve estimation using statistics and geostatistics,

mine cost estimation, engineering economy concepts applied to mineral deposits. Prerequisite: MNG 030
MNG 422 MINE VENTILATION AND AIR CONDITIONING (3) Quality, quantity, and temperature-humidity control of the mine atmosphere; general mine environmental control. Prerequisite: C E 360, MNG 030. Prerequisite or concurrent: M E 030
MNG 431 ROCK MECHANICS (3) Ground stresses, laboratory rock properties, laboratory and field instrumentation, rock mass characteristics, subsidence, slope stability, design of mine workings. Prerequisite: E MCH 210
MNG 441 SURFACE MINING SYSTEMS AND DESIGN (3) Design of surface mining for noncoal and coal minerals; emphasis on quarry and strip mining planning parameters: unit operations, systems, haulroads, draglines, spoil stability, reclamation, legal requirements, and health and safety. Prerequisite: MN PR 301, MNG 030
MNG 442 SURFACE MINE SEDIMENTATION CONTROL (2) Design principals and practices for rainfall runoff control, erosion control systems, and sedimentation pond sizing and construction. Prerequisite: C E 360, MNG 441
MNG 443 STRIP MINE CUT PLANNING (2) Analysis of cut planning, sequencing, and spoil placement in mine and outside dumps for contour, area, and mountain-top mining. Prerequisite: MNG 441
MNG 444 GROUNDWATER ASPECTS IN MINING (2) Physical and chemical hydrology specific to mining and the environment; mine drainage formation, abatement, and remediation.
MNG 445 ENVIRONMENTAL CONCERNS IN THE MINING INDUSTRY (3) Environmental aspects of mining including water and soil contamination; remediation techniques; revegetation and land use planning and legislation. Prerequisite: CHEM 012
MNG 451W MINING ENGINEERING PROJECT (1–5) Independent and integrative design and report of specific mine evaluation, layout, equipment selection, environmental control, permitting, and financial analysis. Prerequisite: seventh-semester standing in mining engineering plus six months of mining work experience
MNG 460 MINE MAINTENANCE ENGINEERING (3) Mine maintenance system design; maintenance planning and management; safety and cost analysis of maintenance programs.

MUSIC (C MUS)

Capital College

C MUS 301 FOUNDATIONS OF MUSIC (3) Study of music from the listener's viewpoint emphasizing methods of perceiving melodic design, tone color, rhythm, harmony, and structure.
C MUS 302 CHORAL MUSIC (1) Instruction in choral singing; experience in performing music of different styles and periods; rudimentary knowledge of musical notation, theory, interpretation. (May be repeated for credit.)
C MUS 309 INTRODUCTION TO THE THEORY AND ANALYSIS OF MUSIC (3) A technical introduction to music including a study of scales, chords, harmonic progressions, contrapuntal techniques, and procedures for analyzing music.
C MUS 325 HISTORY OF MUSIC II (3) Music from 1700 to 1827; the music of the late baroque and the classical periods.
C MUS 326 HISTORY OF MUSIC III (3) Music from 1827 to the present; the romantic era to the contemporary.
C MUS 427 MASTERS OF MUSIC (3 per semester) An intensive investigation of the works of a major composer in Western music history. (May be repeated for credit.) Prerequisite: C MUS 301
C MUS 440 FORMS IN MUSIC (3 per semester) An investigation of the traditional forms of tonal music in Western culture. (May be repeated for credit.) Prerequisite: C MUS 301
C MUS 497 SPECIAL TOPICS (1–9)

MUSIC (MUSIC)

College of Arts and Architecture

Individual instruction in technique, literature, and pedagogy is offered in six categories covering nineteen instruments:

BRASS: Trumpet, French horn, trombone, euphonium, tuba
KEYBOARD: Piano, organ, harpsichord
PERCUSSION
STRINGS: Violin, viola, violoncello, guitar, doublebass
VOICE
WOODWINDS: Flute, oboe, clarinet, bassoon, saxophone

For each instrument, individual instruction is offered to different types of students at different levels:

Primary instrument: Student in B.A. (Music) and B. S. (Music Ed.) Levels I-VIII
Performance instrument: Students in B.Mus. Levels I-VIII
Secondary instrument: Nonmajor students or others using this as secondary instrumen

The courses are designated in a particular pattern for identification on the student's transcript and in the *Schedule of Courses*. Applied music fees are required for individualized instruction. See **www.music.psu.edu**.

For course descriptions for the areas above, see **www.psu.edu/bulletins/bluebook**, click on University Course Descriptions button and then on the link for the instrument area in which you are interested.

MUSIC 005 (GA) AN INTRODUCTION TO WESTERN MUSIC (3) A general survey of art music in western society, highlighting important composers and stylistic developments.
MUSIC 007 (GA;DF) EVOLUTION OF JAZZ (3) Study of the origins and development of jazz as an art form.
MUSIC 008 (GA) RUDIMENTS OF MUSIC (3) Introduction to the elements of music: notation, scales, meter, rhythm, intervals; basic chord structure.
MUSIC 009 (GA;DF) INTRODUCTION TO WORLD MUSICS (3) An overview of the music of India, China, Japan, Indonesia, Africa, and the Middle East.
MUSIC 040S FIRST-YEAR SEMINAR IN MUSIC EDUCATION (1) Overview of campus life, the School of Music and the music education profession.
MUSIC 050 (GA) BEGINNING PIANO: NON-MUSIC MAJOR (1) Introduction to the keyboard, notation, chord progressions, transposition, improvisation, and simple accompanying techniques for the non-music major.
MUSIC 051 (GA) INTERMEDIATE CLASS PIANO: NON-MUSIC MAJOR (1) Instruction in harmonizing melodies, accompanying techniques, improvisation, and repertoire. Prerequisite: MUSIC 050 or placement audition
MUSIC 052 (GA) VOICE CLASS: NON-MUSIC MAJOR (1) Group study emphasizing development of rudimentary skills and their recreational use in a range of popular and art music.
MUSIC 053 CLASS VOICE PRACTICUM (1) Voice study in group and individual formats, supervised by in-class lessons and discussions, enhanced by additional individual instruction with pedagogy students. Prerequisite: audition
MUSIC 054 (GA) BEGINNING CLASS GUITAR: NON-MUSIC MAJOR (1) Class instruction in guitar for non-music majors.
MUSIC 076 CHAMBER ORCHESTRA (1 per semester, maximum of 8) Chamber orchestra rehearsal and performance. Prerequisite: audition
MUSIC 077 (GA) PHILHARMONIC ORCHESTRA (1 per semester, maximum of 8) Orchestra rehearsal and performance. Prerequisite: audition
MUSIC 078 (GA) SYMPHONIC WIND ENSEMBLE (1 per semester, maximum of 8) Rehearsal and performance of wind repertoire and concert band literature. Prerequisite: audition
MUSIC 079 PEP BAND (1 per semester, maximum of 8) A band to perform at selected athletic events. Prerequisite: audition
MUSIC 080 (GA) SYMPHONIC BAND (1 per semester, maximum of 8) Rehearsal and performance of symphonic band literature. A select group using standard instrumentation. Prerequisite: audition
MUSIC 081 (GA) MARCHING BLUE BAND (1 per semester, maximum of 4) Rehearsal and performance of appropriate music and maneuvers for football games and related events. Prerequisite: audition
MUSIC 082 (GA) CONCERT BAND (1 per semester, maximum of 8) Rehearsal and performance of concert band literature. Prerequisite: audition
MUSIC 083 (GA) CAMPUS BAND (1 per semester, maximum of 8) Rehearsal and performance of concert band literature. Prerequisite: audition
MUSIC 084 (GA) JAZZ ENSEMBLE (1 per semester, maximum of 8) Survey and performance of historic and contemporary big band styles. Prerequisite: audition
MUSIC 085 (GA) SINGING LIONS (1 per semester, maximum of 8) Rehearsal and performance of popular music of all eras, including swing, jazz, and show choir styles. Prerequisite: placement audition
MUSIC 086 (GA) PERCUSSION ENSEMBLE (1 per semester, maximum of 8) Study and performance of percussion chamber music in various instrumental combinations, focusing on the classical and contemporary repertoire. Prerequisite: audition
MUSIC 087 MALLET ENSEMBLE (1) Study and performance of music for keyboard percussion instruments. Prerequisite: audition
MUSIC 088 (GA) CAMPUS CHOIR (1 per semester, maximum of 8) Building skills needed for successful choral singing including vocal production, sight singing, ear training, and music fundamentals.
MUSIC 089 (GA) UNIVERSITY CHOIR (1 per semester, maximum of 8) Rehearsal and performance of choral repertoire appropriate to mixed-voice ensemble of 100-150 voices. Prerequisite: audition
MUSIC 090 (GA) GLEE CLUB (1 per semester, maximum of 8) Rehearsal and performance of music composed for male voices from the sixteenth to the twentieth centuries, including sacred and secular compositions. Prerequisite: audition
MUSIC 091 (GA) ORIANA SINGERS (1 per semester, maximum of 8) Rehearsal and performance of choral repertoire for treble voices from the sixteenth to twentieth centuries, including sacred and secular compositions. Prerequisite: AUDITION
MUSIC 092 (GA) CHAMBER MUSIC FOR VOICES (1 per semester, maximum of 8) Select groups of singers performing choral chamber music. Prerequisite: audition
MUSIC 093 (GA) ESSENCE OF JOY (1 per semester, maximum of 8) Rehearsal and performance of choral repertoire from the African/American tradition. Prerequisite: audition
MUSIC 094 (GA) WOMEN'S CHORALE (1 per semester, maximum of 8) Rehearsal and performance of treble choral literature. Prerequisite: audition

MUSIC 101 MUSIC COMMON HOUR (1) Student and faculty recitals, master classes, lectures by faculty and guests, and Common Hour attendance.
MUSIC 103 (GA) CONCERT CHOIR (1 per semester, maximum of 8) Rehearsal and performance of choral repertoire appropriate to mixed-voice ensemble of approximately sixty voices. Prerequisite: audition
MUSIC 104 (GA) CHAMBER SINGERS (1 per semester, maximum of 8) Rehearsal and performance of choral repertoire appropriate to mixed-voice ensemble of approximately twenty-four voices. Prerequisite: audition
MUSIC 106 (GA) EARLY MUSIC ENSEMBLE (1 per semester, maximum of 8) Ensemble for the performance and study of Renaissance or early music on instruments of the era. Prerequisite: audition
MUSIC 110 KEYBOARD SKILLS I: MUSIC MAJOR (1) Introduction to the keyboard, chord progressions, transposition, improvisation, and simple accompanying techniques.
MUSIC 112 CLASS GUITAR (.5–1) Functional guitar techniques and materials.
MUSIC 113 MUSIC THEATRE—CLASS VOICE I (1) Group study emphasizing development of sound vocal and musicianship skills fundamental for music theatre. Prerequisite: admission into the School of Theatre with intent to major in Music Theatre
MUSIC 114 MUSIC THEATRE—CLASS VOICE II (1) Group study emphasizing development of sound vocal and musicianship skills fundamental for music theatre. Prerequisite: MUSIC 113
MUSIC 115 VOICE CLASS (1) Class study of voice, with emphasis on pedagogical experiences and techniques useful in public school music classrooms.
MUSIC 116 INTERMEDIATE VOICE CLASS: MUSIC MAJOR (1) Class study of voice, with emphasis on pedagogical experiences and techniques useful in public school music classrooms. For Music Majors only. Prerequisite: MUSIC 115
MUSIC 119S FIRST-YEAR MUSIC SEMINAR (2) Individual applied instruction and group activities; orientation, area recitals, studio classes as required by instructor. Prerequisite: permission of instructor
MUSIC 121 BASIC MUSICIANSHIP I (1) Elementary sight singing and dictation. Prerequisite: ability to reproduce simple rhythm and tonal patterns Concurrent: MUSIC 131
MUSIC 122 BASIC MUSICIANSHIP II (1) Continuation of Music 121. Prerequisite: MUSIC 121 Concurrent: MUSIC 132
MUSIC 129S FIRST-YEAR PERFORMANCE SEMINAR (3) Individual applied instruction and group activities; orientation, area recitals, studio classes as required by instructor. Prerequisite: permission of instructor
MUSIC 131 MUSIC THEORY I (2) Review of rudiments; introduction to the fundamental linear and vertical features of tonal music, integration of written and aural skills. Prerequisite: ability to read musical notation; knowledge of musical rudiments. Concurrent: MUSIC 121
MUSIC 132 MUSIC THEORY II (2) Continuation of Music 131. Prerequisite: MUSIC 131 Concurrent: MUSIC 122
MUSIC 140 INTRODUCTION TO MUSIC EDUCATION (2) An introduction to historical and philosophical foundations of music education and an examination of the roles of the music teacher.
MUSIC 150 BRASS AND WOODWIND TECHNIQUES (1) Instruction on the teaching and performance of flute, clarinet, saxophone, trumpet, horn, trombone, and tuba for general/choral emphasis Music Education majors.
MUSIC 151 CLASS BRASS (.5 per semester, maximum of 4) Performance and teaching techniques for brass instruments.
MUSIC 152 CLASS PERCUSSION (.5–1 per semester) Performance and teaching techniques for percussion instruments.
MUSIC 153 CLASS STRINGS (.5–1 per semester) Performance and teaching techniques for stringed instruments.
MUSIC 154 CLASS WOODWINDS (.5 per semester, maximum of 4) Performance and teaching techniques for woodwind instruments.
MUSIC 162 INTRODUCTION TO MUSIC HISTORY (2) An introduction to Western music history and world music cultures through the study of representative works. Concurrent: MUSIC 132
MUSIC 170 KEYBOARD SKILLS II: MUSIC MAJOR (1) Instruction in secondary chord progressions, transposition, improvisation, accompanying techniques, simple score reading. Prerequisite: MUSIC 050, MUSIC 110 or placement audition
MUSIC 173 COMPOSITION I (2) Composition instruction for first-year composition majors. Prerequisite: admission to the B.M. degree in Composition
MUSIC 173S FIRST-YEAR COMPOSITION SEMINAR (2) Individual composition instruction for freshman composition majors (Fall semester) and group activities. Prerequisite: admission to the BM program in Composition
MUSIC 174 COMPOSITION II (2) Composition instruction for first-year composition majors. Prerequisite: MUSIC 173
MUSIC 181 JAZZ IMPROVISATION I (2) A study of the fundamentals of jazz theory, harmonic functions, and their applications to jazz improvisation. Prerequisite: MUSIC 132
MUSIC 182 JAZZ IMPROVISATION II (2) A study of advanced harmonic concepts and their application to jazz improvisation. Prerequisite: MUSIC 181
MUSIC 190 (GA) CHAMBER MUSIC FOR STRINGS (1 per semester, maximum of 8) Preparation for performance of advanced chamber music literature involving primarily string instruments—string quartets, piano trios, clarinet quintets. Prerequisite: permission of instructor

MUSIC 191 (GA) CHAMBER MUSIC FOR WOODWINDS (1 per semester, maximum of 8) Preparation for performance of advanced chamber music literature involving primarily woodwind instruments—woodwind quintets and quartets. Prerequisite: permission of instructor
MUSIC 192 (GA) CHAMBER MUSIC FOR BRASS (1 per semester, maximum of 8) Preparation for performance of advanced chamber music literature involving primarily brass instruments—brass quartets and quintets. Prerequisite: permission of instructor
MUSIC 193 SONATA DUOS (1 per semester, maximum of 8) Preparation for performance of advanced sonata literature for various individual instruments with keyboard. Prerequisite: permission of instructor
MUSIC 194 STUDIO AND RECITAL ACCOMPANYING (1 per semester, maximum of 8) Keyboard accompaniment of student soloists in the studio and in public performance under faculty supervision. Prerequisite: KEYBD 120J or KEYBD 130J or consent of supervising faculty member
MUSIC 210 KEYBOARD SKILLS III: MUSIC MAJOR (1) Playing accompaniments from chord symbols and full notation, transposition, improvisation, modulation, score-reading, and standard literature. Prerequisite: MUSIC 170 or placement audition
MUSIC 221 BASIC MUSICIANSHIP III (1) Intermediate sight singing and dictation. Prerequisite: MUSIC 122 Prerequisite or concurrent: MUSIC 231
MUSIC 222 BASIC MUSICIANSHIP IV (1) Continuation of Music 221. Prerequisite: MUSIC 221. Prequisite or concurrent: MUSIC 232
MUSIC 231 MUSIC THEORY III (2) Intermediate concepts of tonal theory. Prerequisite: MUSIC 132
MUSIC 240 MUSIC IN EARLY CHILDHOOD (3) Development of musical knowledge and skills; materials and methods for musical experiences for children in educational and recreational settings. Prerequisite: for students in the N-3 Teacher Certification Program only
MUSIC 241 MUSIC FOR CLASSROOM TEACHERS (3) Development of competencies for guiding musical experiences of children in the elementary classroom. Prerequisite: for students in the K-6 Teacher Certification Program only
MUSIC 256 INTRODUCTION TO FINALE (1) Introduction to music notation processing using Finale on both the IBM and Macintosh platforms. Prerequisite: MUSIC 132
MUSIC 258 FUNDAMENTALS OF MIDI AND DIGITAL AUDIO (1–3) Music Technology (Introduction to how musical information is stored and processed in computer systems.)
MUSIC 261 SURVEY OF MUSIC HISTORY I (3) A survey of music history to 1750, with readings, listening, and lecture. Prerequisite: MUSIC 131, MUSIC 162
MUSIC 262 SURVEY OF MUSIC HISTORY II (3) A survey of music history from 1750 to the present, with readings, listening, and lecture. Prerequisite: MUSIC 132, MUSIC 162
MUSIC 266 BASIC CONDUCTING (1) Basic instruction and practicum in conducting, both choral and instrumental. Prerequisite: MUSIC 221, MUSIC 231
MUSIC 267 TECHNIQUES OF COMPOSITION (2) Basic instruction in the techniques of composition in all idioms. Prerequisite: OR CONCURRENT: MUSIC 231
MUSIC 270 KEYBOARD SKILLS IV: MUSIC MAJOR (1) Instruction in secondary chord progressions, transposition, improvisation, accompanying techniques, score reading. Prerequisite: MUSIC 210 or placement audition
MUSIC 273 COMPOSITION III (2) Composition instruction for second-year composition majors. Prerequisite: MUSIC 174
MUSIC 274 COMPOSITION IV (2) Composition instruction for second-year composition majors. Prerequisite: MUSIC 273
MUSIC 295A PRACTICUM: TEACHING OF MUSIC (1) Observation and pre-service experience in the schools. Prerequisite: EDPSY 014, MUSIC 111, MUSIC 140, MUSIC 270, VOICE PROFICIENCY PASSED Concurrent: MUSIC 340
MUSIC 295B PRACTICUM IN CHORAL MUSIC (.5) Observation and rehearsal of choral ensembles. Prerequisite: MUSIC 340W, MUSIC 348, MUSIC 366, PIANO PROFICIENCY PASSED Concurrent: MUSIC 343
MUSIC 295C PRACTICUM IN INSTRUMENTAL MUSIC (.5) Observation and rehearsal of instrumental ensembles. Prerequisite: MUSIC 151, MUSIC 152, MUSIC 153, MUSIC 154 Concurrent: MUSIC 343
MUSIC 296 INDEPENDENT STUDIES (1–18)
MUSIC 297, 298 SPECIAL TOPICS (1–9)
MUSIC 331 TONAL ANALYSIS (2) Introduction to standard procedures of tonal analysis, including concepts of form and structure. Prerequisite: MUSIC 221, MUSIC 231
MUSIC 332 ANALYSIS OF TWENTIETH CENTURY MUSIC (2) Application of analytical techniques and compositional theories to music of the twentieth century. Prerequisite: MUSIC 331
MUSIC 336 ORCHESTRATION (2) Scoring for the orchestra. Prerequisite: MUSIC 222, MUSIC 232
MUSIC 340W TEACHING OF MUSIC (3) Application of psychological principles to teaching of music, including curriculum design and contemporary practices in music education. Limited to Music Education majors. Prerequisite: EDPSY 014, MUSIC 111, MUSIC 140, MUSIC 270, VOICE PROFICIENCY PASSED
MUSIC 342 (MUSIC) GENERAL MUSIC METHODS AND MATERIALS (2) Methods, materials, and teaching strategies for general music grades K-12. Intended for those with a choral or instrumental emphasis. Prerequisite: MUSIC 295A, MUSIC 340W, piano proficiency passed
MUSIC 343 (MUSIC) CHORAL METHODS AND MATERIALS (2) Selection and analysis of choral literature, study of the adolescent voice; administration of school choral programs. Intended for those with a

general music or instrumental emphasis. Prerequisite: MUSIC 266, MUSIC 295A, MUSIC 340W, MUSIC 348, piano proficiency passed

MUSIC 344 (MUSIC) INSTRUMENTAL METHODS AND MATERIALS (2) Examination and application of teaching strategies and materials for instrumental music in schools. Intended for those with a general music or choral emphasis. Prerequisite: MUSIC 266, MUSIC 295A, MUSIC 340W, MUSIC 349, piano proficiency passed, and at least three of the following: MUSIC 151, MUSIC 152, MUSIC 153, MUSIC 154

MUSIC 366 INTERMEDIATE CONDUCTING (2) Intermediate instruction in conducting; conducting techniques specific to instrumental or choral music; introduction to rehearsal technique. Prerequisite: MUSIC 266, MUSIC 270, MUSIC 331

MUSIC 373 COMPOSITION V (3) Composition instruction for third-year position majors. Prerequisite: MUSIC 274

MUSIC 374 COMPOSITION VI (3) Composition instruction for third-year composition majors. Prerequisite: MUSIC 373

MUSIC 387 LANGUAGE DICTION FOR SINGERS: ITALIAN AND ENGLISH (1) Intensive drill in the pronunciation, phonetic transcription, and singing of Italian and English. Prerequisite: VOICE 170J or VOICE 180J or two semesters of VOICE 100J or VOICE 110J

MUSIC 388 LANGUAGE DICTION FOR SINGERS: FRENCH (1) Intensive drill in the pronunciation, phonetic transcription, and singing of French. Prerequisite: VOICE 170J or VOICE 180J or two semesters of VOICE 100J or VOICE 110J

MUSIC 389 LANGUAGE DICTION FOR SINGERS: GERMAN (1) Intensive drill in the pronunciation, phonetic transcription, and singing of German. Prerequisite: VOICE 170J or VOICE 180J or two semesters of VOICE 100J or VOICE 110J

MUSIC 395A PRACTICUM: GENERAL MUSIC (1) Observation and pre-service experience in the schools. Prerequisite: MUSIC 295A, MUSIC 340W, piano proficiency passed Concurrent: MUSIC 342

MUSIC 395B PRACTICUM: CHORAL (1) Observation and rehearsal of choral ensembles. Prerequisite: MUSIC 266, MUSIC 295A, MUSIC 340W, MUSIC 348, piano proficiency passed Concurrent: MUSIC 343

MUSIC 395C PRACTICUM: INSTRUMENTAL (1) Observation and rehersal of instrumental ensembles. Prerequisite: MUSIC 266, MUSIC 295A, MUSIC 340W, MUSIC 349, piano proficiency passed, and at least three of the following: MUSIC 151, MUSIC 152, MUSIC 153, MUSIC 154 Concurrent: MUSIC 344

MUSIC 400 SOLO RECITAL (1) Required recital for Performer's Certificate. Prerequisite: Permission of the director of the School of Music

MUSIC 412 JAZZ PEDAGOGY (2) The development of advanced skills in pedagogy for teaching jazz bands. Prerequisite: admission to the Music Education program or certification

MUSIC 414 STRING PEDAGOGY (1–2) The development of skills in pedagogy for teaching strings. Prerequisite: COMPLETION OF 300-LEVEL STRINGS COURSE

MUSIC 415 WOODWIND PEDAGOGY (1–2) The development of skills in pedagogy for teaching woodwinds. Prerequisite: COMPLETION OF 300-LEVEL WOODWIND COURSE

MUSIC 416 BRASS PEDAGOGY (1–2) The development of skills in pedagogy for teaching brass. Prerequisite: COMPLETION OF 300-LEVEL BRASS COURSE

MUSIC 417 PERCUSSION PEDAGOGY (1–2) The development of advanced skills in pedagogy for teaching percussion. Prerequisite: MUSIC 152; PERCN 320J or PERCN 330J or permission of instructor

MUSIC 418 VOCAL PEDAGOGY (2) Analysis of techniques of teaching voice and studies of related music literature and pedagogical writings. Prerequisite: VOICE 270J or VOICE 280J; or four semesters of VOICE 100J or VOICE 110J

MUSIC 419 PIANO PEDAGOGY I (2) Analysis of beginning teaching methods and teaching strategies for children. Prerequisite: KEYBD 270 or KEYBD 280; MUSIC 331

MUSIC 421 JAZZ COMBO CLASS (1) Study and performance of small group jazz. Prerequisite: MUSIC 181

MUSIC 422 JAZZ HARMONY AND ARRANGING (3) Analysis and composition of jazz tunes and chord progressions; instrumental and vocal arranging in the jazz idiom. Prerequisite: MUSIC 222, MUSIC 232

MUSIC 424 PIANO PEDAGOGY II (2) Analysis of techniques of teaching intermediate-early advanced level piano and studies of music literature and pedagogical writings. Prerequisite: KEYBD 270 OR KEYBD 280; MUSIC 331

MUSIC 425 ADVANCED VOCAL PEDAGOGY (2) Analysis of techniques of teaching voice, supervised teaching, studies of studio materials and related topics. Prerequisite: MUSIC 418

MUSIC 428 GRADUATE REVIEW OF TONAL ANALYSIS (2) Application of analytical techniques to music from Bach to Brahms. Prerequisite: UNDERGRADUATE CORE IN MUSIC THEORY AND LITERATURE AT AN ACCREDITED UNIVERSITY OR ELEMENTARY ANALYSIS; MUSIC 429 AND 430 IF INDICATED ON ENTERING COMPETENCY EXAM

MUSIC 429 AURAL REVIEW FOR GRADUATE STUDENTS (1) An intensive review of the aural skills required for a theoretical understanding of 18th- and 19th-century music. Prerequisite: MUSIC 221 OR UNDERGRADUATE CORE IN MUSIC THEORY AT AN ACCREDITED UNIVERSITY

MUSIC 430 HARMONY REVIEW FOR GRADUATE STUDENTS (2) An intensive review of tonal harmony from a linear approach, including part- writing and counterpoint. Prerequisite: MUSIC 232 OR UNDERGRADUATE CORE IN MUSIC THEORY AT AN ACCREDITED UNIVERSITY

MUSIC 431 ADVANCED TONAL ANALYSIS (2— 3 per semester) Advanced techniques of musical analysis. Prerequisite: MUSIC 331

MUSIC 432 GRADUATE REVIEW OF TWENTIETH-CENTURY ANALYSIS (2–3) The theory and analysis of style in music of the twentieth century. Prerequisite: MUSIC 262, MUSIC 331
MUSIC 433 ADVANCED ANALYSIS OF TWENTIETH CENTURY MUSIC (2— 3 per semester) In-depth studies of selected twentieth-century repertoires and/or analytical models. Prerequisite: MUSIC 262, MUSIC 332
MUSIC 435 SCORE READING (1) Introduction in score reading at the keyboard. Prerequisite: MUSIC 232; PIANO PROFICIENCY PASSED
MUSIC 438 FIGURED BASS (2) Learning to realize and play figured basses at the keyboard with emphasis on examples from Italy, Germany, France, and England from 1600 to 1800. Prerequisite: MUSIC 232; PIANO PROFICIENCY PASSED
MUSIC 442 GENERAL MUSIC METHODS AND MATERIALS: EMPHASIS (3) Methods, materials, and teaching strategies for general music grades K-12. Intended for those with a general music emphasis. Prerequisite: MUSIC 295A, MUSIC 340W, piano proficiency passed
MUSIC 443 CHORAL METHODS AND MATERIALS: EMPHASIS (3) Selection and analysis of choral literature, study of the adolescent voice; administration of school choral programs. Intended for those with a choral emphasis. Prerequisite: MUSIC 266, MUSIC 295A, MUSIC 340W, MUSIC 348, piano proficiency passed
MUSIC 444 INSTRUMENTAL METHODS AND MATERIALS: EMPHASIS (3) Examination and application of teaching strategies and materials for instrumental music in schools. Intended for those with an instrumental emphasis. Prerequisite: MUSIC 266, MUSIC 295A, MUSIC 340W, MUSIC 349, piano proficiency passed; select at least three courses from: MUSIC 151, MUSIC 152, MUSIC 153, MUSIC 154
MUSIC 450 TEACHING MARCHING BAND (3) Instructional techniques and organizational procedures involved in the teaching of the modern school marching band. Prerequisite: MUSIC 344, MUSIC 349; two years of college marching band
MUSIC 455 TECHNOLOGY IN MUSIC (1–3) Survey of how musical information is stored and processed in computer systems. Prerequisite: CMPSC 100, CMPSC 101, CSE 103, or MUSIC 231
MUSIC 458 ELECTRONIC MUSIC (3) A studio course in the theory and practice of electronic music. Enrollment is restricted to sixteen students. Prerequisite: MUSIC 262
MUSIC 459 PROJECT IN ELECTRONIC MUSIC (1–3 per semester, maximum of 12) A studio course in the theory and practice of electronic music. Enrollment is restricted to 10 students. Prerequisite: MUSIC 458
MUSIC 461W STUDIES IN MUSIC HISTORY: ANTIQUITY TO 1600 (3) In-depth study of selected aspects of music and culture from antiquity to 1600, with emphasis on writing and research. Prerequisite: MUSIC 261, MUSIC 331
MUSIC 462W STUDIES IN MUSIC HISTORY: 1550-1750 (3) In-depth study of selected aspects of music and culture from 1550-1750, with emphasis on writing and research. Prerequisite: MUSIC 261, MUSIC 331
MUSIC 463W STUDIES IN MUSIC HISTORY: 1700-1900 (3) In-depth study of selected aspects of music and culture from 1700-1900, with emphasis on writing and research. Prerequisite: MUSIC 262, MUSIC 331
MUSIC 464W STUDIES IN MUSIC HISTORY: 1850-PRESENT (3) In-depth study of selected aspects of music and culture from 1850 to the present, with emphasis on writing and research. Prerequisite: MUSIC 262, MUSIC 332
MUSIC 465 ADVANCED CONDUCTING I (2) Advanced instruction in conducting; conducting techniques specific to instrumental or choral music; emphasis on score study and rehearsal technique. Prerequisite: MUSIC 366
MUSIC 466 ADVANCED CONDUCTING II (2 per semester, maximum of 8) Standard scores of symphonies, tone poems, operas, oratorios, and shorter vocal and instrumental works studied from the viewpoint of the conductor. Prerequisite: MUSIC 465
MUSIC 467 OPERA WORKSHOP (1–3 per semester, maximum of 6) History, analysis, and production of operas from sixteenth century to present. Prerequisite: audition
MUSIC 471 STRUCTURAL AND SIXTEENTH-CENTURY COUNTERPOINT (2) Advanced species counterpoint and its application to the sixteenth-century style. Prerequisite: MUSIC 222, MUSIC 232
MUSIC 472 EIGHTEENTH-CENTURY COUNTERPOINT (2) Imitative and nonimitative counterpoint in the style of Bach. Prerequisite: MUSIC 222, MUSIC 232
MUSIC 473 COMPOSITION VII (3) Composition instruction for fourth-year composition majors. Prerequisite: MUSIC 374
MUSIC 474 COMPOSITION VIII (3) Composition instruction for fourth-year composition majors. Prerequisite: MUSIC 473
MUSIC 476W B.A. SENIOR PROJECT (3) A semester project appropriate to student's option in B.A. program (e.g., research paper, performance with program notes, or related paper). Prerequisite: seventh-semester standing
MUSIC 478 VOCAL LITERATURE (3) Introduction to the literature for solo voice in opera, oratorio, cantata, art song, and chamber music from the baroque to the present. Prerequisite: MUSIC 262, MUSIC 331
MUSIC 480 OPERA LITERATURE (3) Studies in the development of the opera from 1600 to the present, treating both libretto and music. Prerequisite: MUSIC 262, MUSIC 331
MUSIC 481 KEYBOARD LITERATURE (3) Studies in the development of keyboard music and instruments; a survey of all eras using listening, analysis, and performance. Prerequisite: MUSIC 262, MUSIC 331
MUSIC 483 SEMINAR IN VOCAL PEDAGOGY LITERATURE (2) Survey of literature relevant to the teaching of voice from historical sources through recent pedagogical scholarship. Prerequisite: MUSIC 418
MUSIC 485 CHAMBER MUSIC LITERATURE (3) Survey of chamber music for strings, winds, and brass

instruments from the mid-16th century to the present day. Prerequisite: MUSIC 262, MUSIC 331
MUSIC 487 ORCHESTRAL LITERATURE (3) Survey of orchestral literature. Prerequisite: MUSIC 262, MUSIC 331
MUSIC 489 STUDIO AND RECITAL ACCOMPANIMENT (1 per semester, maximum of 4) Advanced keyboard accompaniment of student soloists in the studio and in public performance under faculty supervision. Prerequisite: MUSIC 194 or permission of instructor
MUSIC 493 SONATA DUOS (1 per semester, maximum of 4) Preparation for performance of advanced sonata literature for various individual instruments with keyboard. Prerequisite: MUSIC 193 or equivalent; permission of instructor
MUSIC 494 RESEARCH TOPICS (1–3) Supervised research leading to senior thesis or project.
MUSIC 495A STUDENT TEACHING: GENERAL MUSIC (5–7) Observation and teaching under supervision. Prerequisite: completion of all courses in the major with a grade of "C" or better Concurrent: MUSIC 442
MUSIC 495B STUDENT TEACHING: CHORAL MUSIC (5–7) Observation and teaching under supervision. Prerequisite: completion of all courses in the major with a grade of "C" or better Concurrent: MUSIC 443
MUSIC 495C STUDENT TEACHING: INSTRUMENTAL MUSIC (5–7) Observation and teaching under supervision. Prerequisite: completion of all courses in the major with a grade of "C" or better Concurrent: MUSIC 444
MUSIC 495D STUDENT TEACHING SEMINAR IN MUSIC EDUCATION (1) Seminar for the professional development of pre-service music educators. Students must be registered for MUSIC 459A and either MUSIC 495B or 495C. Prerequisite: MUSIC 295B, MUSIC 295C, MUSIC 342, MUSIC 343, MUSIC 344, MUSIC 395A; or MUSIC 295C and MUSIC 395B with a grade of "C" or better
MUSIC 496 INDEPENDENT STUDIES (1–18)
MUSIC 497, 498 SPECIAL TOPICS (1–9)

NAVAL SCIENCE (NAVSC)

Intercollege, Reserve Officrs' Training Corps
NAVSC 101 INTRODUCTION TO NAVAL SCIENCE (2) Introduction to naval organization, customs, military law, ships, aircraft, and Marine Corps and Navy career paths.
NAVSC 102 SEA POWER AND MARITIME AFFAIRS (3) Historical evolution of sea power and its effects on world history; current U.S. maritime strategy for employment of naval forces.
NAVSC 203 NAVIGATION AND NAVAL OPERATIONS I (3) Theory and principles of all types of piloting and navigation, including a practicum emphasizing correct documentation and plotting.
NAVSC 204 LEADERSHIP AND MANAGEMENT I (2) Managerial thought and behavioral theories, with emphasis on how they apply to the naval organization.
NAVSC 302 NAVIGATION AND NAVAL OPERATIONS II (3) Introduction to naval operations; the theory and principles of the rules of the road; use of the maneuvering board. Prerequisite: NAVSC 203
NAVSC 311 EVOLUTION OF WARFARE (2) Survey of development of military strategy, tactics, principles of war, and weaponry through the ages and recent U.S. applications.
NAVSC 313 MARINE CORPS LEADERSHIP THEORY AND TECHNIQUES (2) Introduction to Marine Corps leadership theory and techniques and their application to military-related practical skills and subject matter.
NAVSC 322 NAVAL SHIPS SYSTEMS I—NAVAL ENGINEERING (3) Principles and applications of engineering concepts to ship construction, stability, and propulsion and auxiliary systems.
NAVSC 402 LEADERSHIP AND MANAGEMENT II (2) The Navy's Resource Management Program (personnel management), counseling techniques, military justice, prevention of substance abuse, and naval correspondence and publications. Prerequisite: NAVSC 401
NAVSC 411 AMPHIBIOUS WARFARE (2) A historical survey and evaluation of twentieth-century amphibious warfare operations. Prerequisite: 6 credits of Navy ROTC courses
NAVSC 421 NAVAL SHIPS SYSTEMS II—WEAPONS (3) An analysis of electromagnetic wave theory, of underwater sound propagation, electro-optic theory, and weapons control systems. Prerequisite: NAVSC 322
NOTE: Candidates for reqular commission in the Navy will gain practicum work during two afloat summer cruises. Candidates for Regular commission in the Marine Corps will gain practicum work during one afloat summer cruise and one Maine Corps cruise at a Marine Corps base. Additionally, the summer between the sophomore and junior years includes career orientation and training on vocational specialties in the Navy and Marine Corps. Candidates for Reserve commissions in the Navy and the Marine Corps will gain practicum work during one afloat summer cruise or one cruise at a Marine Corps base, respectively.

NUCLEAR ENGINEERING (NUC E)

College of Engineering
NUC E 001S ATOMIC ADVENTURES: FIRST-YEAR SEMINAR (1) First-year seminar exploring the interesting and exciting world of nuclear science and its applications.
NUC E 002S PSU LION LOOP: FIRST-YEAR SEMINAR (1) First-year seminar involving hands-on work and learning using the PSU Lion Loop research project.
NUC E 003S POWER PLANTS AND THEIR SIMULATION: FIRST-YEAR SEMINAR (1) First-year seminar using modern computer tools applied to power plant simulation.
NUC E 097, 297, 397, 497 SPECIAL TOPICS (1–9)

NUC E 296, 496 INDEPENDENT STUDIES (1–18)
NUC E 301 FUNDAMENTALS OF RECTOR PHYSICS (4) Nuclear reactions and interactions relevant to nuclear engineering including fission, cross-sections, reaction rate calculations, energy depositions rates, and radioactive decay. Prerequisite: MATH 230, MATH 251, PHYS 214
NUC E 302 INTRODUCTION TO REACTOR DESIGN (4) Static and dynamic reactor theory applied to basic reactor design problems. Prerequisite: NUC E 301, NUC E 309
NUC E 307 STATISTICAL AND TRANSPORT DESCRIPTION OF MATTER (3) Particle statistical distributions; transport descriptions of matter; energy, momentum, mass transfer; particle diffusion; thermodynamic equilibrium and nonequilibrium spectra. Prerequisite: MATH 251, PHYS 237
NUC E 309 ANALYTICAL TECHNIQUES FOR NUCLEAR CONCEPT (3) This course is an introduction to many of the analytical techniques used in the nuclear engineering discipline. Prerequisite: MATH 230, MATH 251
NUC E 310W ISSUES IN NUCLEAR ENGINEERING (2) Societal and technical issues facing nuclear engineers, including safety, operations, waste, regulation, public acceptance, economics, ethics, and radiation. Prerequisite: fifth-semester standing
NUC E 401 INTRODUCTION TO NUCLEAR ENGINEERING (3) Fundamental concepts of nuclear engineering, including fission, reactor theory, shielding, and radioisotopes; intended for other than nuclear engineering students. Prerequisite: MATH 250 or MATH 251
NUC E 403 ADVANCED REACTOR DESIGN (3) Physical principles and computational methods for reactor analysis and design. Multigroup diffusion theory; determination of fast and thermal group constants; cell calculations for heterogeneous core lattices. Prerequisite: NUC E 302
NUC E 405 (CHEM) NUCLEAR AND RADIOCHEMISTRY (3) Theory of radioactive decay processes, nuclear properties and structure, nuclear reactions, interactions of radiation with matter, biological effects of radiation. Prerequisite: CHEM 452, NUC E 301, or PHYS 237
NUC E 408 RADIATION SHIELDING (3) Radiation sources in reactor systems; attenuation of gamma rays and neutrons; point kernel methods; deep penetration theories; Monte Carlo methods. Prerequisite: NUC E 301
NUC E 409 (MATSE) NUCLEAR MATERIALS (3) Nuclear reactor materials: relationship between changes in material properties and microstructural evolution of nuclear cladding and fuel under irradiation. Prerequisite: PHYS 214
NUC E 420 RADIOLOGICAL SAFETY (3) Ionizing radiation, biological effects, radiation measurement, dose computational techniques, local and federal regulations, exposure control. Prerequisite: NUC E 301 or NUC E 405
NUC E 428 RADIOACTIVE WASTE CONTROL (3) Nature, sources, and control of radioactive wastes; theory and practice of disposal processes. Prerequisite: NUC E 301 or NUC E 405
NUC E 430 DESIGN PRINCIPLES OF REACTOR SYSTEMS (3) Nuclear power cycles; heat removal problems; kinetic behavior of nuclear systems; material and structural design problems. Prerequisite: M E 412; NUC E 301 or NUC E 401
NUC E 431W NUCLEAR REACTOR CORE DESIGN SYNTHESIS (4) Technical and economic optimization of nuclear systems. Prerequisite: ENGL 202C; NUC E 403, NUC E 430
NUC E 444 NUCLEAR REACTOR OPERATIONS LABORATORY (1) Correlation of reactor physics and reactor theory with practical reactor situations that will be controlled by the student. Prerequisite: or concurrent: NUC E 302
NUC E 445 NUCLEAR DIGITAL INSTRUMENTATION (3) Interfacing nuclear instruments to microprocessors and computers. Prerequisite: E E 305
NUC E 450 RADIATION DETECTION AND MEASUREMENT (3) Theory and laboratory applications of radiation detectors, including proton, neutron, charged particle detectors, NIM devices, and pulse-height analysis. Prerequisite: NUC E 301 or NUC E 405; NUC E 309
NUC E 451 EXPERIMENTS IN REACTOR PHYSICS (3) Acquisition and processing of nuclear and atomic data; application to nucleonic phenomena of importance in nuclear engineering. Prerequisite: E E 305, NUC E 450
NUC E 460 NUCLEAR SYSTEMS RISK ASSESSMENT (3) Probability concepts and distributions, failure data, reliability and availability of simple systems, fault and event tree analysis, risk concepts, nuclear power risks, WASH-1400. Prerequisite: NUC E 309 or STAT 401
NUC E 470 POWER PLANT SIMULATION (3) Basic knowledge necessary for intelligent simulation and interpretation of simulations of transients in nuclear power plants. Prerequisite: M E 033, MATH 251, NUC E 302
NUC E 490 (AERSP;E E) INTRODUCTION TO PLASMAS (3) Plasma oscillations; collisional phenomena; transport properties; orbit theory; typical electric discharge phenomena. Prerequisite: E E 361 or PHYS 467
NUC E 494 SENIOR THESIS (1–9) Students must have approval of a thesis adviser before scheduling this course.

NURSING (NURS)

College of Health and Human Development

NURS 044 IINTRODUCTION TO DEATH EDUCATION (1) Educational and consumer aspects of dying and death from a health education perspective.

NURS 101 NURSING I (8) Introduction to associate degree nursing roles and nursing process; emphasis on individual health patterns and selected nursing interventions. Course open only to students majoring in Associate Degree Nursing Program. Prerequisite: or concurrent: BIOL 129 or BIOL 141; BIOL 142, ENGL 015, HD FS 129

NURS 102 NURSING II (8) Emphasis on infancy through young adulthood and perioperative nursing care; common and well-defined health problems with integrated nursing content. Course open only to students majoring in Associate Degree Nursing Program. Prerequisite: NURS 101. Prerequisite or concurrent: BIOL 129 or BIOL 141; and BIOL 142, PSY 002, SOC 001

NURS 110 OVERVIEW OF CRITICAL CARE NURSING (1) Overview of nursing care to critically ill adult clients.

NURS 115 MEDICATIONS AND THE ELDERLY CLIENT (1) Nursing implications of medication therapy with the elderly client.

NURS 197 SPECIAL TOPICS (1–9)

NURS 200W INTRODUCTION TO NURSING RESEARCH (3) Introduction to methods and philosophy of empirical inquiry as applied to research in nursing. Prerequisite: NURS 215, NURS 230, NURS 351, STAT 200; or Prerequisite NURS 290 for Nursing for Registered Nurses majors only

NURS 201 NURSING III (9) Emphasis on middle-aged adults; develop expanding competencies in caring for clients with acute or chronic dysfunctional health patterns. Course open only to students majoring in Associate Degree Nursing Program. Prerequisite: NURS 101, NURS 102. Prerequisite or concurrent: MICRB 106, MICRB 107, Quantification selection

NURS 202W NURSING IV (10) Emphasis on care of older adults with complex emotional or physical dysfunctional health patterns while developing skill in utilizing the nursing process. Course open only to student majoring in Associate Degree Nursing Program. Prerequisite: NURS 101, NURS 102, NURS 201. Prerequisite or concurrent: Arts elective and Humanities elective

NURS 203 (GHA) EMERGENCY CARE AND SAFETY (3) Develop knowledge/skills to become certified in Cardiopulmonary Resuscitation for the Professional Rescurer, First Aid and Safety, and Preventing Disease Transmission.

NURS 205 INTRODUCTION TO PHARMACOLOGICAL CONCEPTS (3) Study of basic concepts of pharmacology and relevant nursing implications. Prerequisite: approval of the department

NURS 215 HEALTH: INTRODUCTION TO WELLNESS (3) Designed to explore the wellness component of health, with emphasis on concepts of health, life-style patterns and nursing interventions.

NURS 225 HEALTH: INTRODUCTION TO ILLNESS (3) Designed to explore the illness component of health, with emphasis on the pathophysiological and psychosocial aspects. Prerequisite: BIOL 129, BIOL 141; MICRB 106, MICRB 107

NURS 230 HEALTH: NURSING PROCESS (4) Analysis of the nursing process and introduction to clinical competencies and psychosocial skills. Prerequisite: NURS 215

NURS 296 INDEPENDENT STUDIES (1–18)

NURS 297, 298 SPECIAL TOPICS (1–9)

NURS 300H HONORS SEMINAR IN NURSING (3–12) Seminar activities on selected topics in nursing. Prerequisite: NURS 230, admission to the Honors Program

NURS 301 NURSING CARE OF CLIENT THROUGH THE ADULT LIFE SPAN REQUIRING MEDICAL INT ERVENTION (4) Practice and delivery of therapeutic nursing care to the adult patient in a variety of primarily medical settings. Prerequisite: NURS 215, NURS 225, NURS 230

NURS 302 NURSING CARE OF THE CLIENT THROUGH THE ADULT LIFE SPAN REQUIRING SUR GICAL INTERVENTION (4) Practice and delivery of therapeutic nursing care to the adult patient in a variety of primarily surgical settings. Prerequisite: NURS 215, NURS 225, NURS 230

NURS 303 CLINICAL APPLICATION OF LABORATORY TESTS (1) A study of the background, meaning, and nursing implications of laboratory test results. Prerequisite: NURS 215, NURS 225, NURS 230

NURS 304 CONCEPTS OF PAIN MANAGEMENT (1) Nursing management of clients experiencing a variety of types of pain. Prerequisite: NURS 215, NURS 225, NURS 230

NURS 310 NURSING CARE OF THE ELDERLY (4) Nursing concerns and intervention in promoting the health of the elderly. Prerequisite: NURS 215, NURS 230, NURS 351

NURS 320 NURSING CARE OF YOUNG ADULTS (4) Methods of and practice in the delivery of therapeutic nursing care to young adults in the childbearing phase of life. Prerequisite: NURS 215, NURS 230, NURS 351

NURS 351 HEALTH ASSESSMENT (3) Designed to broaden the student's knowledge and skills in health assessment and physical examination across the lifespan. Prerequisite: or concurrent: NURS 215, NURS 230; or NURS 101 (for Associate Degree Majors); or RN license

NURS 390 TRANSITION AND THE PROFESSIONAL NURSING ROLE (3) Transition to baccalaureate education and professional nursing practice, emphasizing leadership, management, and issues influencing nursing education and practice. Prerequisite: current and valid RN license

NURS 397, 398 SPECIAL TOPICS (1–9)

NURS 400 PROFESSIONAL ROLE DEVELOPMENT (3) Implications of nursing leadership for the professional nurse. Study of leadership roles and various styles of nursing management. Prerequisite: NURS 310, NURS 301, NURS 320, NURS 406

NURS 401 CONCEPTS OF HEALTH (3) Exploration of current and ancient concepts of health and their respective modes of intervention. Prerequisite: PSY 002 or SOC 001

NURS 402 HOLISTIC HEALTH (3) Examination of emerging conceptualizations of health and therapy based on a holistic view of human beings. Prerequisite: NURS 401

NURS 404 CARDIAC DYSRHYTHMIAS: INTERPRETATION, TREATMENT, AND NURSING MANAGEMENT (1) An introductory course with a focus on dysrhythmia recognition and interpretation of abnormal 12-lead electrocardiograms (EKG, ECG). Prerequisite: BIOL 141, BIOL 129 or equivalent, or approval of program

NURS 405 NURSING CARE OF THE ADULT CLIENT WITH COMPLEX HEALTH PROBLEMS (4) In-depth study of care of patients with acute and complex health problems, utilizing nursing theory and practice. Prerequisite: NURS 301, NURS 302, NURS 310, NURS 320,and NURS 351

NURS 406 NURSING CARE OF CHILDREN AND ADOLESCENTS (4) Common health problems and nursing intervention for children and adolescents. Prerequisite: NURS 301, NURS 302, NURS 310, NURS 320, NURS 351

NURS 407 DRUGS OF ABUSE AND MENTAL HEALTH ISSUES (3) Examines the health care needs across the lifespan of clients who have an alcohol or other drug disorder. Prerequisite: BB H 143, or PSY 002,or approval of program

NURS 408 CLINICAL APPLICATION OF PHARMACOLOGICAL CONCEPTS (1) Study of the application of pharmacological concepts to the clinical setting. Prerequisite: NURS 310, NURS 315, NURS 320, NURS 331, NURS 351

NURS 409 INTRODUCTION TO FORENSIC NURSING (3) Provides an introduction to the forensic health sciences, forensic nursing, and the nursing role in the scientific investigation of violence. Prerequisite: NURS 215, NURS 225, NURS 230

NURS 415 (GI) COMMUNITY AND FAMILY HEALTH NURSING—CONCEPTS AND APPLICATIONS (4) Health promotion concepts to meet the health care needs of multicultural families and groups in community health nursing practice. Prerequisite: NURS 205, NURS 225, NURS 310, NURS 301, NURS 320, NURS 406, NURS 351

NURS 417 (GI) FAMILY AND COMMUNITY HEALTH CONCEPTS (4) Study of the concepts of family and community based nursing care emphasizing multicultural influences on health practices. Prerequisite: NURS 390 and RN license

NURS 418 APPLICATION OF FAMILY AND COMMUNITY HEALTH CONCEPTS (3) Application of family and community health concepts in a specialized practice setting. Prerequisite: NURS 390, NURS 417, NURS 457

NURS 420 MENTAL HEALTH NURSING (4) Emphasizes the clinical application of mental health theory in nursing care of patients with acute and chronic mental health problems. Prerequisite: NURS 205, NURS 225, NURS 310, NURS 301, NURS 320, NURS 406, NURS 351

NURS 425 SCHOOL HEALTH NURSING (3) Study and experience with the roles and responsibilities of the school health nurse. Prerequisite: NURS 415

NURS 430 ORGANIZATION AND ADMINISTRATION FOR THE NURSE MANAGER (3) Introduction to organizational theory and principles of practice in the administration of nursing services and patient care. Prerequisite: RN license or completion of: NURS 310, NURS 301, NURS 320, and NURS 406

NURS 431 DATA MANAGEMENT FOR NURSE MANAGERS (3) Analysis of information systems to manage nursing service organizations; includes financial management, the budgeting processes, and productivity measurement. Prerequisite: RN license or completion of: NURS 310, NURS 301, NURS 320, and NURS 406

NURS 432 NURSING MANAGEMENT OF HUMAN RESOURCES (3) Human resource management and related factors in nursing service organizations. Prerequisite: NURS 310, NURS 301, NURS 320, and NURS 406; or RN license

NURS 433 SEMINAR FOR NURSE MANAGERS (3) Course focuses on the application of management principles in the role of the nurse manager. Prerequisite: RN license or completion of: NURS 310, NURS 301, NURS 320, and NURS 406

NURS 440 TRAUMA/CRITICAL CARE NURSING (3) Focuses on the impact of and the nursing care of persons experiencing acute trauma and/or critical illness. Prerequisite: NURS 310, NURS 301, NURS 320, NURS 406, NURS 351

NURS 445 TRAUMA NURSING (3) Emphasizes components of clinical nursing practice in the care of persons acutely traumatized. Prerequisite: NURS 310, NURS 301, NURS 320, NURS 406, and NURS 351

NURS 450 REHABILITATION NURSING (3) Study and application of rehabilitation principles and techniques for patients manifesting functional impairment and disability. Prerequisite: NURS 310, NURS 301, NURS 320, NURS 406, and NURS 351

NURS 452 (BB H;WMNST) WOMEN'S HEALTH ISSUES (3) Exploration of major health issues concerning women today, with an emphasis on social, cultural, and medical influences. Prerequisite: BIOL 141 or PSY 002

NURS 457 INTRODUCTION TO COMPUTING AND NURSING INFORMATICS (3) An introduction to computers and nursing informatics focusing on applications to the nursing profession. Prerequisite: NURS 215, NURS 230, STAT 200; or RN license

NURS 458 ETHICAL CHALLENGES IN HEALTHCARE INFORMATICS (3) A case based collaboratory designed for the exploration and analysis of the ethical dilemmas facing healthcare informatics practitioners. Prerequisite: NURS 457

NURS 464 DYING AND DEATH (3) Explores attitudes toward death and dying; concept of grief; responsibilities to the dying person and the family. Prerequisite: PSY 002 or SOC 001

NURS 465 HEALTH CONCEPTS FOR ADULTS WITH COMPLEX HEALTH CARE NEEDS (3) In-depth study of the theoretical principles and roles of adult clients and families with complex health care needs. Prerequisite: NURS 390, NURS 457
NURS 466 APPLICATION OF ADULT HEALTH CONCEPTS (4) Application of the theoretical principles and roles of adult health nursing to clients and families in clinical settings. Prerequisite: NURS 465
NURS 492 EMERGENCY CARE AND SAFETY (3) A comprehensive first aid course designed to provide knowledge of prehospital emergency care at the First Responder level. Prerequisite: BIOL 141, BIOL 129 or equivalent, or approval of program
NURS 495 NURSING STUDY IN SPECIALIZED SETTING (1–12) Designed to provide student with in-depth study and practice in clinical specialty area of choice. Prerequisite: seventh-semester standing
NURS 496 INDEPENDENT STUDIES (1–18)
NURS 497, 498 SPECIAL TOPICS (1–9)
NURS 498 SPECIAL TOPICS (1–9)
NURS 499 (GI) FOREIGN STUDY—NURSING (1–9) Study of nursing issues in a foreign country.

NUTRITIONAL SCIENCES (NUTR)

College of Health and Human Development

NUTR100 (GHS) CONTEMPORARY NUTRITION CONCERNS (1.5) Interpretation of nutrition principles in relation to contemporary problems in selecting a diet to promote a healthy lifestyle. Students who have received credit for NUTR 151 or NUTR 251 may not schedule this course.
NUTR 115 THEORY OF EXERCISE AND NUTRITION FOR WEIGHT CONTROL (1) Nutrition application for responsible weight control. Concurrent: ESACT 115
NUTR 119 ELEMENTARY FOODS (3) Basic principles and fundamental processes underlying food preparation. For non-nutrition majors only.
NUTR 120 FOOD PREPARATION (3) Scientific principles of basic food preparation, with an emphasis on the physical and chemical aspects. Prerequisite: CHEM 034
NUTR 151 NUTRITION COMPONENT OF THE FOOD SERVICE SYSTEM (3) Introduction to basic nutrition principles and their application in a food service system. Students who have taken NUTR 251 may not schedule this course.
NUTR 170 CAREERS IN NUTRITION (1) Nutrition professionals describe career paths and opportunities for graduates in applied and science options; strategies for making effective career decisions.
NUTR 199 (GI) FOREIGN STUDIES (1–12)
NUTR 230 (HIST;S T S) AMERICAN FOOD SYSTEM: HISTORY, TECHNOLOGY AND CULTURE (3) A cultural analysis of the evolution of U.S. agricultural production and food consumption patterns, the food industry and food marketing.
NUTR 251 (GHA) INTRODUCTORY PRINCIPLES OF NUTRITION (3) The nutrients: food sources and physiological functions as related to human growth and well-being throughout life; current nutrition issues. Students who have passed NUTR 151 may not schedule this course.
NUTR 252 DIET THERAPY AND NUTRITION CARE IN DISEASE (4) Principles of nutrition care to meet therapeutic needs, inpatient care, and rehabilitation. Prerequisite: NUTR 151 or NUTR 251
NUTR 253 NUTRITION CARE OF THE ELDERLY (3) Introduction to the psychosocial, nutritional, and physiological needs of the elderly with emphasis on the delivery of nutrition care. Prerequisite: NUTR 151 or NUTR 251
NUTR 280 (D S M) CURRENT ISSUES IN COMMUNITY DIETETICS (3) Current issues impacting community dietetics programs with emphasis on the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). Prerequisite: D S M 195
NUTR 281 (D S M) FACILITATED DISCUSSION IN COMMUNITY DIETETICS (2) Principles and methods of designing, implementing, and evaluating facilitated discussion to provide effective nutrition education. Prerequisite: D S M 280
NUTR 296 INDEPENDENT STUDIES (1–18)
NUTR 297, 298 SPECIAL TOPICS (1–9)
NUTR 299 (GI) FOREIGN STUDIES (1–12)
NUTR 358 ASSESSMENT OF NUTRITIONAL STATUS (2) Introduction to purpose, methods, and scientific basis for assessment of nutritional status in total health care for individuals and groups. Prerequisite: NUTR 251
NUTR 359 NUTRITION ASSESSMENT THEORY AND PRACTICE (2) Introduction to purpose, methods, and scientific basis for assessment of nutritional status and use of tools in a practice setting. Prerequisite: NUTR 151 OR NUTR 251
NUTR 360 DISSEMINATING NUTRITION INFORMATION (3) Theory and practice of providing nutrition information across the lifespan. Open only to Health and Human Development majors. Prerequisite: NUTR 251
NUTR 370 PROFESSION OF DIETETICS (1) Introduction to the profession of dietetics including laws, regulations and standards affecting practice, and preparation for post-baccalaureate degree training. Prerequisite: senior standing in Nutrition or Hotel, Restaurant, and Institutional Management
NUTR 375 NUTRITION PEER EDUCATION TRAINING (2) To train students accepted into the HealthWorks Peer Education Program, to provide reliable nutrition information to their peers. Prerequisite: NUTR 251. Prerequisite or concurrent: NUTR 360
NUTR 395 NUTRITION FIELD EXPERIENCE (1–6) Prerequisite: NUTR 251; fourth-semester standing
NUTR 399 (GI) FOREIGN STUDIES (1–12)

NUTR 400 INTRODUCTION TO NUTRITION COUNSELING (1) Prerequisite: NUTR 358. Prerequisite or concurrent: NUTR 446
NUTR 401 NUTRITION CLINIC PRACTICUM (1–3) To provide qualified nutrition students with the opportunity to practically apply nutrition counseling skills in a supervised environment. Prerequisite: NUTR 400
NUTR 421 (GI) FOOD CULTURE AND HEALTH TRENDS (3) Social-political, historic, and geographic roots of food patterns, featuring specific cuisine areas and nutritional disease patterns; includes foods laboratory. Prerequisite: NUTR 119 or NUTR 120; NUTR 151 or NUTR 251
NUTR 430 (GI) (S T S) GLOBAL FOOD STRATEGIES: PROBLEMS AND PROSPECTS FOR REDUCING WORLD HUNGER (3) Technological, social, and political solutions to providing basic food needs; food resources, population, and the environment; current issues.
NUTR 445 NUTRIENT METABOLISM I (3) Nutrients, their sources, metabolism, interrelationships and requirements with focus on carbohydrates, lipids, and proteins. Prerequisite: B M B 211, BIOL 141, NUTR 251
NUTR 446 NUTRIENT METABOLISM II (3) Continuation of NUTR 445; nutrients, their sources, metabolism, inter- relationships and requirements with focus on vitamins and minerals. Prerequisite: NUTR 445
NUTR 451 NUTRITION THROUGHOUT THE LIFE CYCLE (3) Application of basic principles of nutrition to nutritional and physiological needs throughout the life cycle from prenatal to aging. Prerequisite: NUTR 358 NUTR 445. Prerequisite or concurrent: NUTR 446
NUTR 452 NUTRITIONAL ASPECTS OF DISEASE (3) Disturbances in metabolism related to human disease processes; principles of nutrition in therapy. Prerequisite: NUTR 446
NUTR 453 DIET IN DISEASE (3) Nutrient and energy controlled diet programs. Implications for nutrition counseling and education. Prerequisite: or concurrent: NUTR 452
NUTR 454 LABORATORY METHODS IN NUTRITION (3) Research and clinical methods for study of nutritional phenomena, interpretation of data in relation to various nutritional and physiological states. Prerequisite: or concurrent: NUTR 446
NUTR 456 COMMUNITY NUTRITION (2) Programs and policies of nutrition-related activities of community agencies; factors pertinent to nutrition education. Prerequisite: NUTR 251
NUTR 490W NUTRITION SEMINAR (3) Use of selected materials from the scientific literature to prepare a term paper and an oral report. Prerequisite: or concurrent: NUTR 452
NUTR 495 ADVANCED FIELD EXPERIENCE IN NUTRITION (1–6) Supervised off-campus, non-group instruction including individual field experiences, practicums or internships. Written and oral critique of activity is required. Prerequisite: NUTR 456
NUTR 496 INDEPENDENT STUDIES (1–18)
NUTR 497, 498 SPECIAL TOPICS (1–9)
NUTR 499 (GI) FOREIGN STUDIES (1–12)

OCCUPATIONAL THERAPY (O T)

Berks-Lehigh Valley College; Commonwalth College
O T 097, 098 SPECIAL TOPICS (1–9)
O T 100 STRUCTURAL FOUNDATIONS OF OCCUPATIONAL THERAPY (1) An overview of the structural foundations of the occupational therapy profession.
O T 101 CONCEPTUAL FOUNDATIONS OF OCCUPATIONAL THERAPY PRACTICE (3) An overview of the conceptual foundations of occupational therapy practice. Observation of therapists in treatment settings. Prerequisite: O T 100 or current
O T 103 OCCUPATIONAL PERFORMANCE ACROSS THE LIFE SPAN (3) Analysis of occupations from birth to death including descriptions of occupational performance and factors which influence performance. Prerequisite: O T 100, O T 101
O T 103L ACTIVITY ANALYSIS: DAILY LIVING SKILLS (3) Analysis of physical limitations that hinder independent performance of self-care, leisure, and work. Methods to enable performance. Prerequisite: O T 101
O T 103P ACTIVITY ANALYSIS: DAILY LIVING SKILLS Analysis of physical limitations that hinder independent performance of self-care, leisure, and work. Methods to enable performance. Prerequisite: O T 101
O T 105W ACTIVITY ANALYSIS: GROUP INTERACTION SKILLS (3) Group interaction observed and analyzed. Activities to facilitate and enhance interactions practiced. Prerequisite: O T 101, PSY 002
O T 107 ACTIVITY ANALYSIS: ASSISTIVE TECHNOLOGIES AND METHODS OF ADAPTATION (3) Assistive technologies and methods of adaptation analyzed; selection criteria, methodologies, proper use, and precautions presented. Prerequisite: O T 101
O T 107L ACTIVITY ANALYSIS: ASSISTIVE TECHNOLOGIES AND METHODS OF ADAPTATION (3) Assistive technologies and methods of adaptation analyzed; selection criteria, methodologies, proper use, and precautions presented. Prerequisite: O T 101
O T 107P ACTIVITY ANALYSIS: ASSISTIVE TECHNOLOGIES AND METHODS OF ADAPTATION Assistive technologies and methods of adaptation analyzed; selection criteria, methodologies, proper use, and precautions presented. Prerequisite: O T 101
O T 197 SPECIAL TOPICS (1–9)
O T 198 SPECIAL TOPICS (1–9)
O T 202 OCCUPATIONAL THERAPY FOR DEVELOPMENTAL DISABILITIES (3) Occupational therapy assessments, interventions, documentation for pediatric/developmental disability practice, observation and practice of techniques in treatment settings. Prerequisite: HD FS 129, O T 103, O T 105, O T 107

O T 204 OCCUPATIONAL THERAPY FOR PSYCHOSOCIAL DYSFUNCTIONS (3) Occupational therapy evaluation, intervention, documentation, methods for psychosocial dysfunctions. Observation of therapists in treatment settings. Prerequisite: HD FS 129, O T 103, O T 105

O T 206 OCCUPATIONAL THERAPY FOR PHYSICAL DISABILITIES (3) Occupational therapy evaluation, intervention, documentation methods for physical disabilities, observation of therapists in treatment settings. Prerequisite: BIOL 129, BIOL 141, BIOL 142, O T 103, O T 107

O T 295A FIELD EXPERIENCE IN OCCUPATIONAL THERAPY I (6) Part I of supervised experience in select occupational therapy settings in the role of an occupational therapy assistant; seminars included. Prerequisite: satisfactory completion of first 3 semester course requirements

O T 295B FIELD EXPERIENCE IN OCCUPATIONAL THERAPY II (6) Part II of supervised experience in select occupational therapy settings in the role of an occupational therapy assistant; seminars included. Prerequisite: satisfactory completion of first three semester course requirements

O T 297 SPECIAL TOPICS (1–9)

O T 298 SPECIAL TOPICS (1–9)

O T 384 HUMAN KINESIOLOGY FOR OCCUPATIONAL PERFORMANCE (3) Theory and application of anatomical, neuromuscular, and mechanical fundamentals of human stability, motion, and force in relation to occupational performance. Prerequisite: BIOL 129, BIOL 141, BIOL 142

O T 401 CONCEPTUAL FOUNDATIONS OF OCCUPATIONAL THERAPY AND OCCUPATIONAL ADAPTATIONS (2) Analysis of philosophies and frames of reference for occupational therapy practice, emphasizing occupational functioning, the adaptation process, and occupational environments. Occupational Therapy majors only.

O T 402 NEUROSCIENCE FOUNDATIONS OF OCCUPATIONAL FUNCTIONING (4) The course will examine neuroanatomical, neurochemical, and neurophysiological functions affecting sensorimotor, cognitive, and effective domains of human performance. Occupational Therapy majors only. Prerequisite: BIOL 129, BIOL 141, BIOL 142

O T 403 MOTOR COMPONENTS OF OCCUPATIONAL ADAPTATION AND PERFORMANCE (3) Analysis of adaptive, homeostatic, and dysadaptive motor patterns across the life span; theory and application of related occupational therapy assessment. Prerequisite: O T 402

O T 404 SENSORY AND PERCEPTUAL COMPONENTS OF OCCUPATIONAL ADAPTATION AND PER FORMANCE (3) Adaptive, dysadaptive, and homeostatic sensory and perceptual skills across the life span; theory and application of related occupational therapy evaluation. Prerequisite: O T 402

O T 405 COGNITIVE AND PSYCHOSOCIAL COMPONENTS OF OCCUPPATIONAL ADAPTATION AND PER FORMANCE (4) Adaptive, dysadaptive, and homeostatic cognitive and psychosocial skills across the life span; theory and application of related occupational therapy evaluation. Prerequisite: O T 402

O T 406 OCCUPATIONAL CHALLENGES OF INFANTS AND YOUNG CHILDREN (3) Conditions interfering with occupational functioning of infants and young children; theory, evaluation, program design, and treatment for facilitating occupational adaptation. Prerequisite: O T 403, O T 404, O T 405

O T 407 OCCUPATIONAL CHALLENGES OF OLDER CHILDREN AND ADOLESCENTS (3) Conditions interfering with occupational functioning of older children and adolescents; theory, evaluation, program design, and treatment for facilitating occupational adaptation. Prerequisite: O T 403, O T 404, O T 405

O T 408 OCCUPATIONAL CHALLENGES OF ADULTS (4) Conditions interfering with occupational functioning of adults; theory, evaluation, program design, and treatment for facilitating occupational adaptation. Prerequisite: O T 403, O T 404, O T 405

O T 409 OCCUPATIONAL CHALLENGES OF OLDER ADULTS (4) Conditions interfering with occupational functioning of older adults; theory, evaluation, program design, and treatment for facilitating occupational adaptation. Prerequisite: O T 403, O T 404, O T 405

O T 410 ENVIRONMENTAL AND TECHNOLOGICAL INFLUENCES ON OCCUPATIONAL ADAPTATION AND PER FORMANCE (3) Impact of occupational environments on functioning and technological adaptation for mastery over the environment. Prerequisite: O T 403, O T 404, O T 405

O T 411 OCCUPATIONAL THERAPY MANAGEMENT AND PROFESSIONAL ETHICS (3) Ethical, managerial, fiscal, and legal responsibilities of program administration, supervision, practice, delivery, and professional development. Prerequisite: O T 401

O T 412W INTRODUCTION TO RESEARCH (3) Introduction to quantitative and qualitative research process relative to occupational therapy. Prerequisite: O T 407, O T 408, O T 409; STAT 200 or STAT 250

O T 495A LEVEL I FIELDWORK EXPERIENCE (1 per semester, maximum of 3) Practicum in 3 of 5 areas: occupational therapy evaluation procedures; environmental and technological adaptation; program design; management issues; selected topics. Prerequisite: concurrent with occupational therapy didactic course work

O T 495B FIELDWORK LEVEL II PART 1 (6) Three month practical educational experience facilitating clinical reasoning and application of professional knowledge, behaviors, values, and skills. Prerequisite: completion of O T 495A and all didactic course work

O T 495C FIELDWORK LEVEL II PART 2 (6) Three month practical educational experience facilitating clinical reasoning and application of professional knowledge, behaviors, values, and skills. Prerequisite: successful completing of O T 495B

O T 496 INDEPENDENT STUDIES (1–18)

O T 497 SPECIAL TOPICS (1–9)

OPERATIONS AND INFORMATION SYSTEMS MANAGEMENT (OISM) *Smeal College of Business*

OISM 150 PRODUCTION AND OPERATIONS MANAGEMENT (3) Quantitative tools and techniques used in managing the production function of a firm, including inventory control, production scheduling, capacity planning. Prerequisite: MATH 021
OISM 296 INDEPENDENT STUDIES (1–18)
OISM 297 SPECIAL TOPICS (1–9)
OISM 301 OPERATIONS MANAGEMENT (3) Decision making and analyses of major management problems that arise in the operations function of business firms. May not be used to satisfy Smeal College baccalaureate degree requirements. Prerequisite: MS&IS 200
OISM 401W (MS&IS) STATISTICS AND QUALITY CONTROL (3) Statistical methods for measurement and improvement of quality; topics include statistical inference, process control, and design. Prerequisite: MATH 110 OR MATH 140; MS&IS 200
OISM 418 MATERIALS MANAGEMENT (3) Design of planning and control systems for managing the flow of materials. Prerequisite: B A 302 or B LOG 301; MS&IS 391
OISM 455 (MS&IS) RISK ANALYSIS OF BUSINESS SYSTEMS (3) Construction and solution of Monte Carlo simulation models and probabilistic models with application to management planning, control systems, and decision making. Prerequisite: MS&IS 200
OISM 470W TOTAL QUALITY MANAGEMENT (3) Development of quality systems in organizations; process reengineering, benchmarking and assessment. Fundamentals of statistical quality control. Prerequisite: B A 302 or B LOG 301
OISM 476 PROCESS ANALYSIS (3) Design and management of business processes, models of the process and its flows, and implications for managerial actions. Prerequisite: B A 302 or B LOG 301; MS&IS 391
OISM 479W (M I S) MANAGEMENT OF OPERATIONS INFORMATION/ERP (3) Origin and management of product, process, cost, demand, and time databases and their use for decision support systems within operations. Prerequisite: M I S 431. Concurrent: M I S 432
OISM 494 RESEARCH PROJECT (1–12)
OISM 496 INDEPENDENT STUDIES (1–18)
OISM 497 SPECIAL TOPICS (1–9)

PSU FIRST-YEAR SEMINAR (PSU)

Various Colleges

The course descriptions for the following first-year seminars are all the same: Facilitate student's adjustment to the high expectations, demanding workload, increased academic liberties, and other aspects of the transition to college life.
PSU 001 FIRST-YEAR SEMINAR ABINGTON (1)
PSU 002 FIRST-YEAR SEMINAR AGRICULTURAL SCIENCE (1)
PSU 003 FIRST-YEAR SEMINAR ALTOONA (1)
PSU 004 FIRST-YEAR SEMINAR ARTS AND ARCHITECTURE (1)
PSU 005 FIRST-YEAR SEMINAR BERKS-LEHIGH VALLEY (1)
PSU 006 FIRST-YEAR SEMINAR BUSINESS ADMINISTRATION (1)
PSU 007 FIRST-YEAR SEMINAR BEHREND (1)
PSU 008 FIRST-YEAR SEMINAR COMMONWEALTH (1) F
PSU 008S FIRST-YEAR SEMINAR COMMONWEALTH (1)
PSU 008T FIRST-YEAR SEMINAR COMMONWEALTH (1)
PSU 009 FIRST-YEAR SEMINAR COMMUNICATIONS (1)
PSU 010 FIRST-YEAR SEMINAR EARTH AND MINERAL SCIENCES (1)
PSU 011 FIRST-YEAR SEMINAR EDUCATION (1)
PSU 012 FIRST-YEAR SEMINAR ENGINEERING (1)
PSU 013 FIRST-YEAR SEMINAR CAPITAL (1)
PSU 014 FIRST-YEAR SEMINAR HEALTH AND HUMAN DEVELOPMENT (1)
PSU 015 FIRST-YEAR SEMINAR LIBERAL ARTS (1)
PSU 016 FIRST-YEAR SEMINAR SCIENCE (1)
PSU 017 FIRST-YEAR SEMINAR SCHOOL OF INFORMATION SCIENCES AND TECHNOLOGY (1)

PETROLEUM AND NATURAL GAS ENGINEERING (P N G)

College of Earth and Mineral Sciences

P N G 020 Facilitate student's adjustment to the high expectations, demanding workload, increased academic liberties, and other aspects of the transition to college life.
INTRODUCTORY PETROLEUM ENGINEERING (3) Introduction to fluid transfer operations of the earth; production of petroleum, natural gas, and water; storage of natural gas. Covers conservation implications.
P N G 382 SEMINAR (1) Discussions and presentations of current problems and literature as related to technological and economic aspects of the petroleum industry.
P N G 397 SPECIAL TOPICS (1–9)
P N G 398 SPECIAL TOPICS (1–9)

P N G 405 ROCK AND FLUID PROPERTIES (3) Reservoir rock properties, rock and fluid properties (interaction between rock and fluids), flow behavior in reservoir, and fluid properties. Prerequisite: PHYS 211
P N G 406 ROCK AND FLUID LABORATORY (1) Systematic study of oil reservoir rocks and fluids; their interrelation applied to petroleum engineering. Prerequisite: PHYS 211 Concurrent: P N G 405
P N G 410 APPLIED RESERVOIR ENGINEERING (3) Analysis and prediction of reservoir performance by use of material balance and steady and nonsteady state flow equations. Prerequisite: P N G 405, P N G 406, PHYS 211
P N G 411 INTRODUCTION TO PETROLEUM AND NATURAL GAS EXTRACTION (1) Introduction to the design and implementation of the systems used in the extraction of oil and gas. Not intended for petroleum and natural gas engineering majors. Prerequisite: PHYS 211
P N G 420 APPLIED RESERVOIR ANALYSIS AND SECONDARY RECOVERY (4) Application of material balance equations/transient flow solutions to water influx problems; displacement theory as it applies to design/behavior of flooding. Prerequisite: P N G 410; CMPSC 201C or CMPSC 201F
P N G 425 PRINCIPLES OF WELL TESTING AND EVALUATION (3) Mathematical basis for pressure analysis. Theory and practice of pressure testing techniques. Prerequisite: MATH 251, P N G 420
P N G 430 RESERVOIR MODELING (3) The numerical simulation of petroleum reservoir processes by the use of models; scaling criteria and network flow. Prerequisite: MATH 251, P N G 410; CMPSC 201C or CMPSC 201F
P N G 440W FORMATION EVALUATION (3) Study of those methods used to evaluate the engineering properties of oil and gas bearing reservoir formations. Prerequisite: P N G 405, P N G 406
P N G 450 DRILLING DESIGN AND PRODUCTION ENGINEERING (3) Design and analysis of oil-field drilling operations and equipment. Prerequisite: C E 360, E MCH 210
P N G 451 OIL WELL DRILLING LABORATORY (1) Practice in well-control procedures. Measurement of drilling fluid properties. Prerequisite: C E 360, E MCH 210 Concurrent: P N G 450
P N G 475 PETROLEUM ENGINEERING DESIGN (3) Design and selection of mechanical components used in the production of fluids from subsurface reservoirs. Prerequisite: E MCH 210
P N G 480 PRODUCTION PROCESS ENGINEERING (3) Analysis and evaluation of surface production processes, fluid separation, storage, measurement, treating, custody transfer, transmission, disposal, corrosion, and other operations. Prerequisite: C E 360; M E 023 or M E 030
P N G 482 PRODUCTION ENGINEERING LABORATORY (1) Measurement and analyses of the physical and chemical properties of hydrocarbon fluid systems in a production environment. Prerequisite: C E 360; M E 023 or M E 030 Concurrent: P N G 480
P N G 486 TERTIARY OIL RECOVERY METHODS (3) Presentation of theory of tertiary methods of oil recovery, current field applications, future engineering potential.
P N G 489 ENGINEERING EVALUATION OF OIL AND GAS PROPERTIES (3) Application of present worth and rate-of-return analysis; reserve calculations; decline curve analysis; uncertainty and risk analysis to engineering project design and evaluation. Prerequisite: ECON 002 Concurrent: P N G 405
P N G 490 INTRODUCTION TO PETROLEUM ENGINEERING DESIGN (1) Introduction to the concepts of engineering design as applied to petroleum and natural gas projects. Prerequisite: ECON 002, P N G 405, P N G 489
P N G 491 RESERVOIR ENGINEERING DESIGN (1) Application of the concepts of reservoir and drilling engineering to petroleum engineering design projects. Prerequisite: ECON 002, P N G 410, P N G 450, P N G 490
P N G 492 PETROLEUM ENGINEERING CAPSTONE DESIGN (1) Integration of petroleum and natural gas engineering concepts to project design. Prerequisite: P N G 491
P N G 494 THESIS (1–6) A problem in petroleum engineering involving review of the literature and experimental data obtained in the field or laboratory.
P N G 497, 498 SPECIAL TOPICS (1–9)
NOTE: Courses in the use of X-ray diffraction, electron microscopy, and spectroscopy in petroleum and natural gas studies are listed under MATERIALS SCIENCE and GEOLOGICAL SCIENCES.

PHILOSOPHY (PHIL)

College of the Liberal Arts
PHIL 001 (GH) BASIC PROBLEMS OF PHILOSOPHY (3) Introduction to central philosophical themes, including the mind/body problem, the existence of God, ethical problems, the nature of reality.
PHIL 002 (GH) PHILOSOPHY, POLITICS, AND SOCIAL THEORY (3) Examines relations between political and social organizations, the justification and limits of the state, and issues concerning individuality and community.
PHIL 003 (GH) PERSONS, MORAL VALUES, AND THE GOOD LIFE (3) Major ethical positions and assumptions regarding questions of freedom, choice, obligation, and conflicts in contemporary moral conduct, values, and reasoning.
PHIL 005 (GH) PHILOSOPHY, ART, AND FILM (3) Explores relations between images and reality, representation and culture, and beauty and politics through film, artworks, and aesthetic theories.
PHIL 006 (GH) (CMLIT) PHILOSOPHY AND LITERATURE IN WESTERN CULTURE (3) Explores fundamental issues of human existence through the traditions of western literature and philosophy.
PHIL 007 (GH;GI) ASIAN PHILOSOPHY (3) Introduction to philosophical, moral, and aesthetic teachings of Asian traditions such as Hinduism, Buddhism (including Zen), Taoism, Confucianism, and Shintoism.

PHIL 008 (GH) PHILOSOPHY AND FEMINISM (3) Explores diverse feminist philosophies of culture and knowledge, and examines gender's role in accounts of reality, truth, morality, and justice.
PHIL 009 (GH;DF) PHILOSOPHY, RACE, AND DIVERSITY (3) Critically examines the significance of race and cultural diversity for, and in, understandings of reality, knowledge, truth, morality, and justice.
PHIL 010 (GH) CRITICAL THINKING (3) discussion of the validity, soundness, and fallacies of everyday language use and reasoning; informal logic; and manipulative arguments and propaganda.
PHIL 011 (GH) PHILOSOPHY, SCIENCE, AND TRUTH (3) Examines the philosophical foundations of natural scientific inquiry, knowledge, objectivity, and the relation of scientific truth to common sense.
PHIL 012 (GQ) SYMBOLIC LOGIC (3) Formal logical structures of propositions and arguments; mechanical tests and proof techniques for logically necessary truth and deductive validity.
PHIL 013 (GH) PHILOSOPHY, NATURE, AND THE ENVIRONMENT (3) Studies competing historical and contemporary conceptions of nature, their philosophical foundations, and their implications for environmental problems and public policy.
PHIL 014 PHILOSOPHY OF LOVE AND SEX (3) Explores Western theories and attitudes concerning intimacy and examines various ethical issue involving love and sex.
PHIL 083S (GH) FIRST-YEAR SEMINAR IN PHILOSOPHY (3) Critical introduction to philosophical issues in ethics, social and political theory, religion, art, metaphysics, and epistemology.
PHIL 098 SPECIAL TOPICS (1–9)
PHIL 100 (GH) THE MEANING OF HUMAN EXISTENCE (3) Explores differing views of the significance of human life, the meaning of freedom, and the way to a meaningful life.
PHIL 101 (GH) PRAGMATISM AND AMERICAN PHILOSOPHY (3) An introduction to American thought and its relation to American culture, with a focus on the development of pragmatism.
PHIL 102 (GH) EXISTENTIALISM AND EUROPEAN PHILOSOPHY (3) Introduction to European philosophy and issues of life, death, meaning, and absurdity, with a focus on existentialism and its development.
PHIL 103 (GH) INTRODUCTION TO ETHICS (3) Ethical theory about virtue, duty, autonomy, and life quality applied to moral problems, including character, violence, oppression, abortion, and suicide.
PHIL 103W (GH) INTRODUCTION TO ETHICS (3) Ethical theory about virtue, duty, autonomy, and life quality applied to moral problems, including character, violence, oppression, abortion, and suicide. Prerequisite: ENGL 015 or ENGL 030
PHIL 105 (GH) INTRODUCTION TO PHILOSOPHY OF LAW AND LEGAL ETHICS (3) Historical and contemporary philosophies of law; concepts of responsibility, property, rights, and justice; and ethical issues in legal practice.
PHIL 106 (GH) INTRODUCTION TO BUSINESS ETHICS (3) Studies ethical foundations of business and ethical problems in business practices such as advertising, international trade, labor relations, and marketing.
PHIL 107 (GH) (S T S) INTRODUCTION TO PHILOSOPHY OF TECHNOLOGY (3) The character of technology; its relation to human values; philosophical assumptions in its development; and how it transforms the world.
PHIL 108 (GH) INTRODUCTION TO SOCIAL AND POLITICAL PHILOSOPHY (3) Critical introduction to political authority, rights, justice, community, inequality, power, pluralism, and other contemporary social and political issues.
PHIL 108W (GH) INTRODUCTION TO SOCIAL AND POLITICAL PHILOSOPHY (3) Critical examination of political authority, rights, justice, community, inequality, power, pluralism, and other contemporary social and political issues. Prerequisite: ENGL 015 or ENGL 030
PHIL 109 (GH) INTRODUCTION TO AESTHETICS (3) Examines the nature of art and aesthetic experience, art's relation to beauty and truth, and the nature of creativity.
PHIL 110 (GH) INTRODUCTION TO PHILOSOPHY OF SCIENCE (3) Examines science's assumptions about knowledge and reality, the relation between science and culture, and the nature of scientific progress.
PHIL 113 (GH) INTRODUCTION TO PHILOSOPHY OF LITERATURE (3) Examines philosophical ideas in literature, literary forms in philosophies, style and genre, and relation of philosophy, literature, writing, and culture.
PHIL 115 (GH) INTRODUCTION TO PHILOSOPHY AND EDUCATION (3) Examines the nature and goals of education, the philosophical foundations of educational theories, and their economic, political, and cultural implications.
PHIL 116 (GH) INTRODUCTION TO PHILOSOPHY OF SOCIAL SCIENCE (3) Examines the philosophical foundations of the social sciences, focussing on issues of methodology, quantification, objectivity, and value-neutrality.
PHIL 117 (GH) INTRODUCTION TO PHILOSOPHY OF MATHEMATICS (3) Central philosophical issues regarding mathematics, including the reality of numbers, set theory, truth and content, and realism/anti-realism in mathematics.
PHIL 118 (GH) INTRODUCTION TO ENVIRONMENTAL PHILOSOPHY (3) Considers the moral status of the environment and applies ethical theory to issues such as preservation, hunger, pollution, and sustainability.
PHIL 120 (GH) INTRODUCTION TO PHILOSOPHY OF ECONOMICS (3) Studies philosophical issues such as individualism and preference, behavior and choice, and history and politics in economic systems and theories.
PHIL 122 (GH) INTRODUCTION TO PHILOSOPHY OF HISTORY (3) Examines methodological foundations and interpretations of history, the objectivity of history, and the issue of history as design or chance.
PHIL 123 (GH) INTRODUCTION TO ETHICS IN MEDIA AND JOURNALISM (3) Studies ethical problems, human values, and politics in differing media forms and the ways media shape such problems and values.

PHIL 124 (GH) INTRODUCTION TO PHILOSOPHY OF RELIGION (3) Explores the meaning of religious belief and experience, the existence of God, ideas of spirituality, and the question of immortality. Prerequisite: third-semester standing
PHIL 125 (GH) INTRODUCTION TO THEORIES OF KNOWLEDGE (3) Historical and contemporary views on the foundations and conditions of knowledge, belief, justification, and truth, conception, perception, and interpretation.
PHIL 125W (GH) INTRODUCTION TO THEORIES OF KNOWLEDGE (3) Historical and contemporary views on the foundations and conditions of knowledge, belief, justification, and truth, conception, perception, and interpretation. Prerequisite: ENGL 015 or ENGL 030
PHIL 126 (GH) INTRODUCTION TO METAPHYSICS (3) Explores the nature of being and reality, the problem of free will and the mind/body problem, identity, and causality.
PHIL 126W (GH) INTRODUCTION TO METAPHYSICS (3) Explores the nature of being and reality, the problem of free will and the mind/body problem, identity, and causality. Prerequisite: ENGL 015 or ENGL 030
PHIL 127 (GH) INTRODUCTION TO PHILOSOPHY OF MIND (3) Problems and concepts of mind and consciousness including mind-brain identification, the nature of subjectivity, identity, and artificial intelligence.
PHIL 129 (GH) INTRODUCTION TO PHILOSOPHY OF LANGUAGE (3) Studies the nature of meaning in language, how we acquire language, communication, signs, and language as descriptive of reality.
PHIL 131 (GH) INTRODUCTION TO AGRICULTURAL ETHICS (3) Includes the study of animal rights, international development, environmental sustainability, biotechnology, social policy and justice, and agrarian community.
PHIL 132 (GH) (RL ST) INTRODUCTION TO BIOETHICS (3) Studies questions of ethics in relation to biotechnology research and implementation, genetic engineering, medicine, animal and human rights.
PHIL 132S (GH) INTRODUCTION TO BIOETHICS (3) Studies questions of ethics in relation to biotechnology research and implementation, genetic engineering, medicine, animal and human rights.
PHIL 197, 198 SPECIAL TOPICS (1–9)
PHIL 199 (GI) FOREIGN STUDY—PHILOSOPHY (1–12) Courses offered in foreign countries by individual or group instruction.
PHIL 200 (GH) (CAMS) ANCIENT PHILOSOPHY (3) Examines the thought and influence of major Western thinkers from the pre-Socratics to the neo-Platonists, emphasizing Plato and Aristotle.
PHIL 201 (GH) MEDIEVAL PHILOSOPHY (3) Examines the thought and influence of major Western thinkers from the fourth to the fifteenth centuries, emphasizing Augustine and Aquinas.
PHIL 202 (GH) MODERN PHILOSOPHY (3) Examines the thought and influence of major Western thinkers from Descartes to Kant, emphasizing rationalism and empiricism, and critical philosophy.
PHIL 203 (GH) NINETEENTH-CENTURY PHILOSOPHY (3) Examines the thought and influence of major Western thinkers from Hegel to Nietzsche, including Marx, Kierkegaard, and Schopenhauer.
PHIL 204 (GH) TWENTIETH-CENTURY PHILOSOPHY (3) Examines the thought and influence of major Western thinkers of the century, including pragmatists, phenomenologists, existentialists, critical theorists, and feminists.
PHIL 208 (GH) CONTEMPORARY PHILOSOPHY (3) Recent trends in philosophical thought and culture, hybrid philosophies, and the philosophical landscape of the future.
PHIL 212 (GQ) SYMBOLIC LOGIC (3) The logic of propositions, relations, and quantification; the nature and properties of formal systems. Intended primarily for science-oriented students.
PHIL 221 (GH) PHILOSOPHY OF SCIENCE (3) An inquiry into the form and function of concepts, laws, theories, and into the character of scientific explanation and prediction.
PHIL 233 (GH) (S T S) ETHICS AND THE DESIGN OF TECHNOLOGY (3) Ethics and individual and group decision-making in the design of technology including design projects and specific attention to institutional ethics.
PHIL 294 RESEARCH PROJECT (1–12)
PHIL 296 INDEPENDENT STUDIES (1–18)
PHIL 297, 298 SPECIAL TOPICS (1–9)
PHIL 299 (GI) FOREIGN STUDIES (1–12)
PHIL 300H HONORS COURSE IN PHILOSOPHY (3–12) Honors program of intensive individual or group study in one of the areas or issues of philosophy. Prerequisite: fifth-semester standing, all-University average of B, approval by Departmental Honors Advisor
PHIL 395 INTERNSHIP (1–18)
PHIL 398 SPECIAL TOPICS (1–9)
PHIL 399 (GI) FOREIGN STUDY—PHILOSOPHY (1–12) Courses offered in foreign countries by individual or group instruction.
PHIL 401 (AM ST) AMERICAN PHILOSOPHY (3) Survey of key figures and movements in American thought including the Transcendentalists, the Pragmatists, and contemporary developments. Prerequisite: 9 credits of philosophy or 6 credits of philosophy at the 200-level
PHIL 402 EUROPEAN PHILOSOPHY (3 per semester, maximum of 6) Survey of key figures and movements of Europe, including phenomenology, existentialism, structuralism and post-structuralism, and critical theory. Prerequisite: PHIL 102, 6 credits of philosophy at the 200 level
PHIL 403 ENVIRONMENTAL ETHICS (3) Examines ethical theories, justice, rights, community, and human values revolving around such issues as preservation, conservation, pollution, sustainability, and population. Prerequisite: 9 credits of philosophy, including PHIL 103 or 6 credits of philosophy at the 200 level

PHIL 405 PHILOSOPHY OF LAW (3) Examines philosophical views of the nature of law, legal ethics, law and society through questions regarding definition, interpretation, and institutions. Prerequisite: 9 credits of philosophy, including PHIL 105 or 6 credits of philosophy at the 200 level

PHIL 406 BUSINESS ETHICS (3) Examines the moral justification of business practices and economic systems through critical analyses of case studies and applied ethical theories. Prerequisite: fifth-semester standing

PHIL 407 (S T S) TECHNOLOGY AND HUMAN VALUES (3) Interrelationships of twentieth-century technological change and human values. Emphasis on the social and ethical aspects of technological progress. Prerequisite: 9 credits of philosophy, including PHIL 107 or 6 credits of philosophy at the 200 level

PHIL 408 SOCIAL AND POLITICAL PHILOSOPHY (3) Historical and philosophical foundations of political organization, authority, justice, and contemporary issues of rights, community, and culture. Prerequisite: 9 credits in philosophy, including PHIL 108 and one 200-level philosophy course; two 200-level philosophy courses

PHIL 408W SOCIAL AND POLITICAL PHILOSOPHY (3) Historical and philosophical foundations of political organization, authority, and justice, and contemporary issues of rights, community, and culture. Prerequisite: 9 credits in philosophy, including PHIL 108 or 6 credits at the 200 level

PHIL 409 AESTHETICS (3) Studies concepts of beauty, truth, value, representation, production and reproduction, and reality through philosophical theory and works of art. Prerequisite: 9 credits of philosophy, including PHIL 109 or 6 credits of philosophy at the 200 level, or 3 credits of art

PHIL 410 PHILOSOPHY OF SCIENCE (3) Historical and contemporary foundational and methodological issues such as causality, relativity and epistemological relativism, teleology, and the nature of reality. Prerequisite: 9 credits of philosophy, including PHIL 110 or 6 credits of philosophy at the 200 level

PHIL 412 PHILOSOPHICAL LOGIC (3) The character of thought in terms of truth properties, modality, reference, relations between propositions, and theories of argument and inference. Prerequisite: 9 credits of philosophy, including PHIL 012 or 6 credits of philosophy at the 200 level

PHIL 413 PHILOSOPHY OF LITERATURE (3) Discusses truth, belief, illusion, imagination and creativity through philosophical literature, as well as problems of philosophical writing. Prerequisite: 9 credits of philosophy, including PHIL 113 or 6 credits of philosophy at the 200 level

PHIL 415 PHILOSOPHY OF EDUCATION (3) Philosophical foundations of education, the nature of learning and the educated individual, and education's political, social, and economic relations. Prerequisite: 9 credits of philosophy, including PHIL 115 or 6 credits of philosophy at the 200 level

PHIL 416 PHILOSOPHY OF SOCIAL SCIENCE (3) Examines the philosophical nature and foundations of methodology, structures and objects, value-neutrality and objectivity in the social sciences. Prerequisite: 9 credits of philosophy, including PHIL 116 or 6 credits of philosophy at the 200 level

PHIL 417 PHILOSOPHY OF MATHEMATICS (3) Examines the historical foundations of mathematics, modern developments of logicism, formalism, and intuitionism, and the contemporary realism/ anti-realism debate. Prerequisite: 9 credits of philosophy, including PHIL 117 or 6 credits of philosophy at the 200 level

PHIL 418 ETHICS (3) Examines ethical theories, justice, rights, community, and human values revolving around such issues as preservation, conservation, pollution, sustainability, and population. Prerequisite: 9 credits of philosophy including PHIL 103 or 6 credits of philosophy at the 200 level

PHIL 418W ETHICS (3) Examines ethical theories, justice, rights, community, and human values revolving around such issues as preservation, conservation, pollution, sustainability, and population. Prerequisite: 9 credits of philosophy, including PHIL 103 or 6 credits of philosophy at the 200 level

PHIL 420 PHILOSOPHY OF ECONOMICS (3) Studies the historical philosophical foundations of economic theory, questions of normativity, feasibility, choice, contracts, and politics in economic theory. Prerequisite: 9 credits of philosophy, including PHIL 120 or 6 credits of philosophy at the 200 level

PHIL 422 PHILOSOPHY OF HISTORY (3) Philosophical investigation of history as content and knowledge, objectivity and relativism in historical analysis, historical laws, interpretation, explanation and narrativity. Prerequisite: 9 credits of philosophy, including PHIL 122 or 6 credits of philosophy at the 200 level

PHIL 423 PHILOSOPHY, MEDIA, AND SOCIETY (3) Examines philosophical and ethical questions of communication, culture, information, ideology, and political and social organization through the forms of media. Prerequisite: fifth-semester standing

PHIL 424 PHILOSOPHY OF RELIGION (3) Examines the relation between faith and reason, the nature of religious experience, the problem of evil, the existence of God. Prerequisite: 9 credits of philosophy, including PHIL 124 or 6 credits of philosophy at the 200 level

PHIL 425 EPISTEMOLOGY (3) The nature of cognition and perception, the conditions of experience, and the justification and truth of belief. Prerequisite: 9 credits of philosophy, including PHIL 125 or 6 credits of philosophy at the 200 level

PHIL 425W EPISTEMOLOGY (3) The nature of cognition and perception, the conditions of experience, and the justification and truth of belief. Prerequisite: 9 credits of philosophy, including PHIL 125 or 6 credits of philosophy at the 200 level; in addition to ENGL 015 or ENGL 030

PHIL 426 METAPHYSICS (3–6) Examines the nature of reality, the existence of freedom, and the nature of matter, mind, and values. Prerequisite: 9 credits of philosophy, including PHIL 126 or 6 credits of philosophy at the 200 level

PHIL 426W METAPHYSICS (3) Examines the nature of reality, the existence of freedom, and the nature of matter, mind, and values. Prerequisite: 9 credits in philosophy, including PHIL 126 or 6 credits of philosophy at the 200 level

PHIL 427 PHILOSOPHY OF MIND (3) Investigates problems of mind from the standpoint of traditional metaphysical views, modern scientific psychology, neuroscience, and artificial intelligence. Prerequisite: 9 credits of philosophy, including PHIL 127 or 6 credits of philosophy at the 200 level

PHIL 429 PHILOSOPHY OF LANGUAGE (3) The nature of language through philosophical discussion of meaning, semantics, pragmatics, the relation between language and mind, and ordinary language. Prerequisite: 9 credits of philosophy, including PHIL 129 or 6 credits of philosophy at the 200 level

PHIL 431 PHILOSOPHY AND AGRICULTURE (3) Studies philosophical and ethical questions regarding agriculture, politics, and policy, including food safety, environment, international development, community, and sustainability. Prerequisite: fifth-semester standing

PHIL 432 (S T S) MEDICAL AND HEALTH CARE ETHICS (3) Examines ethical, political, and social issues in the research, implementation, and practice of medicine, medical technologies, and healthcare. Prerequisite: fifth-semester standing

PHIL 433 (S T S) ETHICS IN SCIENCE AND ENGINEERING (3) Ethical issues arising in the practice of science and engineering and their philosophical analysis.

PHIL 434H (HIST;J ST;RL ST) MONOTHEISM AND THE BIRTH OF THE WEST (3) The birth of monotheism and its relation to social organization, the idea of individuality, and science. Prerequisite: CAMS 004, CAMS 110, CAMS 120, or HIST 102

PHIL 435 (S T S) THE INTERRELATION OF SCIENCE, PHILOSOPHY, AND RELIGION (3) The historical and transformative interactions between science and Western philosophical and religious views of nature, humanity, and God.

PHIL 437 WORLD PHILOSOPHIES AND CULTURES (3) Philosophical traditions, problems, and authors in African, Asian, Middle- Eastern, Native American, or other non-Western cultures and intellectual traditions. Prerequisite: 9 credits of philosophy, including 6 credits of philosophy at the 200 level

PHIL 438 FEMINIST PHILOSOPHY (3) Examines the central currents of feminist philosophy, selected problems and concepts regarding difference, gender and sex, identity, and political culture. Prerequisite: 9 credits of philosophy, including 6 credits of philosophy at the 200 level

PHIL 453 TOPICS IN ANCIENT PHILOSOPHY (3 per semester, maximum of 6) Examines the philosophy of central figures in ancient philosophy from the pre-Socratics to the post-Aristotelians and Neoplatonists. Prerequisite: 9 credits of philosophy, including PHIL 200 or 6 credits of philosophy at the 200 level

PHIL 454 TOPICS IN MEDIEVAL PHILOSOPHY (3 per semester, maximum of 6) Topics include major medieval philosophical theories of God, soul, nature, universes, political society, ethics, and logic. Prerequisite: 9 credits of philosophy, including PHIL 201 and one other 200 level philosophy course

PHIL 455 TOPICS IN MODERN PHILOSOPHY (3 per semester, maximum of 6) Descartes to Kant, including mind and reality, space and time, God and nature, morality and autonomy. Prerequisite: 9 credits of philosophy, including PHIL 202 or 6 credits of philosophy at the 200 level

PHIL 456 TOPICS IN NINETEENTH-CENTURY PHILOSOPHY (3 per semester, maximum of 6) Hegel to Nietzsche, including nature and spirit, history and human nature, ideology and morality. Prerequisite: 9 credits of philosophy, including PHIL 203 or 6 credits of philosophy at the 200 level

PHIL 457 TOPICS IN TWENTIETH-CENTURY PHILOSOPHY (3 per semester, maximum of 6) Topics in the philosophy of figures such as Husseri, James, Russell, Wittgenstein, Heidegger, Merleau-Ponty, and Dewey. Prerequisite: 9 credits of philosophy, including PHIL 204 or 6 credits of philosophy at the 200 level

PHIL 458 TOPICS IN CONTEMPORARY PHILOSOPHY (3 per semester, maximum of 6) Topics in the philosophy of contemporary figures such as Foucault, Habermas, Rorty, Derrida, Rawls, Davidson, and MacIntyre. Prerequisite: 9 credits of philosophy, including PHIL 208 or 6 credits of philosophy at the 200 level

PHIL 461 PLATO (3–6) Examines the metaphysics, epistemology, politics, aesthetics, and moral theory of this central figure in the history of philosophy. Prerequisite: 9 credits of philosophy, including PHIL 200 or 6 credits of philosophy at the 200 level

PHIL 462 ARISTOTLE (3–6) Epistemology, metaphysics, natural science, moral and political theory of this central figure in the history of philosophy. Prerequisite: 9 credits of philosophy, including PHIL 200 or 6 credits of philosophy at the 200 level

PHIL 464 AUGUSTINE (3 per semester, maximum of 6) Examines Augustine's philosophy and religious thought regarding God, friendship, evil, free will, community, creation, memory and time, meaning and truth. Prerequisite: 9 credits of philosophy, including PHIL 201 or 6 credits of philosophy at the 200 level

PHIL 465 AQUINAS (3 per semester, maximum of 6) Examines Aquinas' philosophy, political and moral theory regarding knowledge and existence of God, faith, truth, nature, logic, and the soul. Prerequisite: 9 credits of philosophy, including PHIL 201 or 6 credits of philosophy at the 200 level

PHIL 470 RATIONALISM (3–6) Examines the epistemological emphasis on reason over experience in rationalist philosophers such as Descartes, Leibniz, and Spinoza. Prerequisite: 9 credits in philosophy, including PHIL 202 and 3 other credits of philosophy at the 200 level

PHIL 471 EMPIRICISM (3 per semester, maximum of 6) Examines the epistemological emphasis on experience over reason in empiricist philosophers such as Locke, Hume, Berkeley, and contemporary philosophers. Prerequisite: 9 credits of philosophy, including PHIL 202 or 6 credits of philosophy at the 200 level

PHIL 472 ENLIGHTENMENT (3–6) Examines Enlightenment views on reason, history, individuals, belief, and science through study of Locke, Voltaire, Diderot, Kant, and their critics. Prerequisite: 9 credits in philosophy, including PHIL 202 or 6 credits of philosophy at the 200 level

PHIL 473 GERMAN IDEALISM (3 per semester, maximum of 6) Critically examines the philosophy of central German idealists, including Kant, Fichte, Schelling, and Hegel, and its impact on later philosophy. Prerequisite: 9 credits of philosophy, including either PHIL 202 or PHIL 203, or 6 credits of philosophy at the 200 level
PHIL 474 KANT (3–6) Critical examination of the metaphysics, epistemology, aesthetics, legal and moral philosophy, and influence of Immanuel Kant. Prerequisite: 9 credits in philosophy, including PHIL 202 or 6 credits of philosophy at the 200 level
PHIL 475 FICHTE AND SCHELLING (3 per semester, maximum of 6) The transformation of post-Kantian idealism before Hegel through Fichte's and Schelling's works on nature, history, reason, morality, and spirit. Prerequisite: 9 credits of philosophy, including PHIL 202 or 6 credits of philosophy at the 200 level
PHIL 476 HEGEL (3–6) Critical examination of the metaphysics, moral theory, epistemology, and philosophy of history of this central figure of 19th-century philosophy. Prerequisite: 9 credits of philosophy, including PHIL 203 or 6 credits of philosophy at the 200 level
PHIL 477 KIERKEGAARD (3 per semester, maximum of 6) Studies this 19th-century thinker's ideas on ethical and aesthetic values, despair and selfhood, institutions and individuals, reality, and faith. Prerequisite: 9 credits of philosophy, including either PHIL 203 or 6 credits of philosophy at the 200 level
PHIL 479 CRITICAL THEORY (3 per semester, maximum of 6) Examines the ontology, political and social thought of the Frankfurt School from Horkheimer and Adorno to Marcuse and Habermas. Prerequisite: 9 credits of philosophy, including either PHIL 203 or 6 credits of philosophy at the 200 level
PHIL 480 MARX (3 per semester, maximum of 6) Examines the evolution of Marx's economic, social, and political thought, and metaphysics, and their transformations by later Marxist thinkers. Prerequisite: 9 credits of philosophy, including PHIL 203 or 6 credits of philosophy at the 200 level
PHIL 481 NIETZSCHE (3–6) Friedrich Nietzsche's basic ideas, including master and slave morality, the will to power, eternal recurrence, genealogical inquiry, and naturalism. Prerequisite: 9 credits of philosophy, including PHIL 203 or 6 credits of philosophy at the 200 level
PHIL 482 PEIRCE (3 per semester, maximum of 6) Examination of Peirce's system of the sciences, with an emphasis on his categories, pragmatism and pragmaticism, semiotic, and cosmology. Prerequisite: 9 credits of philosophy, including PHIL 401 or 6 credits of philosophy at the 200 level
PHIL 483 JAMES (3 per semester, maximum of 6) James' psychology, pluralistic metaphysics, theories of truth and meaning, radical empiricism, and idea of religious experience. Prerequisite: 9 credits of philosophy, including PHIL 401 or 6 credits of philosophy at the 200 level
PHIL 484 HUSSERL (3 per semester, maximum of 6) Examines Husserl's phenomenology from the early to later works including his studies of essences, intentionality, intersubjectivity, and the life-world. Prerequisite: 9 credits of philosophy, including PHIL 202, PHIL 203 or 6 credits of philosophy at the 200 level
PHIL 485 HEIDEGGER (3 per semester, maximum of 6) Studies Heidegger's metaphysical thought from his early to later works regarding being, history, subjectivity, aesthetics, language, and his influence. Prerequisite: 9 credits of philosophy, including PHIL 402 or 6 credits of philosophy at the 200 level
PHIL 486 WITTGENSTEIN (3–6) Examines Wittgenstein's early and late work, including logical atomism, meaning, language games, forms of life, and the private-language argument. Prerequisite: 9 credits of philosophy, including PHIL 204 or 6 credits of philosophy at the 200 level
PHIL 487 ANALYTIC PHILOSOPHY (3 per semester, maximum of 6) Analytic philosophy's founding by Frege, Russell, Moore, Wittgenstein; and its contemporary development by Quine, Kripke, Dummett, and Davidson. Prerequisite: 9 credits of philosophy, including PHIL 202 or PHIL 204 along with 3 credits of philosophy at the 200 level
PHIL 488 POST-STRUCTURALISM (3–6) Studies concepts of power, desire, subjectivity, and difference through the work of thinkers including Lacan, Foucault, Derrida, Deleuze, and Lyotard. Prerequisite: 9 credits of philosophy, including either PHIL 203 or PHIL 204 and 6 credits of philosophy at the 200 level
PHIL 490 DEWEY (3 per semester, maximum of 6) Critically examines the metaphysics, epistemology, ethics, logic, aesthetics, education theory, and social and political philosophy of this major American pragmatist. Prerequisite: 9 credits of philosophy, including PHIL 401 or 6 credits of philosophy at the 200-level
PHIL 491 MERLEAU-PONTY (3 per semester, maximum of 6) Merleau-Ponty's phenomenological anti-dualism through his studies on the body and the flesh, aesthetics, political philosophy, and late ontology. Prerequisite: 9 credits of philosophy, including PHIL 402 or 6 credits of philosophy at the 200-level
PHIL 492 FOUCAULT (3 per semester, maximum of 6) Foucault's critique of history, methodological archaeology and genealogy, studies of madness and sexuality, and theory of knowledge, power, and subjectivity. Prerequisite: 9 credits of philosophy, including PHIL 402 or 6 credits of philosophy at the 200-level
PHIL 493 PHENOMENOLOGY AND HERMENEUTICS (3 per semester, maximum of 6) Studies major figures and issues in phenomenology and hermeneutics, focussing on the work of Husserl, Gadamer, Heidegger, Merleau-Ponty, and Levinas. Prerequisite: 9 credits of philosophy, including PHIL 202 and PHIL 204
PHIL 494 RESEARCH PROJECT (1–12)
PHIL 496 INDEPENDENT STUDIES (1–18)
PHIL 497, 498 SPECIAL TOPICS (1–9)
PHIL 499 (GI) FOREIGN STUDY—PHILOSOPHY (1–12) Courses offered in foreign countries by individual or group instruction.

PHILOSOPHY (PHILO)

Penn State Erie, The Behrend College

PHILO 444 ANCIENT PHILOSOPHY (3) A critical look at the beginnings of philosophy beginning with the pre-Socratics and concluding with the hellenistic era. Prerequisite: 3 credits in philosophy.

PHILOSOPHY (PHLOS)

Capital College

PHLOS 301 APPROACHES TO PHILOSOPHY (3) Introduction to the nature of philosophical inquiry. An examination of fundamental philosophical issues and their relation to contemporary society.

PHLOS 305 LOGIC (3) Principles of deductive inference and their application to the analysis and evaluation of arguments.

PHLOS 345 ETHICS (3 per semester) A consideration of important ethical issues; e.g., the definition of the good or the conflict of duties. (May be repeated for credit.)

PHLOS 415 AESTHETICS (3) Philosophical issues dealing with the production, criticism, and experience of the arts.

PHLOS 416 FILM AESTHETICS (3) A study of the aesthetics of the medium of film, viewer response, and film theory.

PHLOS 417 PHILOSOPHY OF MIND (3) An examination of philosophical issues in the foundation of psychology (e.g., mind–body, behaviorism, and psychoanalysis).

PHLOS 418 EASTERN PHILOSOPHIES (3) Exploration of the main tenets of the philosophical systems of Buddhism, Hinduism, Taoism, and Confucianism. Prerequisite: 9 credits in the humanities

PHLOS 431 PHILOSOPHICAL PERSPECTIVES (3 per semester) Philosophical issues in an area of social value (e.g., business ethics, environmental ethics). (May be repeated for credit.)

PHLOS 490 PHILOSOPHIC TOPICS (3 per semester) An examination of a specific problem, issue, or figure in philosophy. (May be repeated for credit.)

PHLOS 494 RESEARCH PROJECT (1–12)

PHLOS 496 INDEPENDENT STUDIES (1–18)

PHLOS 497 SPECIAL TOPICS (1–9)

PHYSICAL SCIENCE (PH SC)

Eberly College of Science

PH SC 007 PHYSICAL SCIENCE (3) Development of physics, including modern physical concepts and their relationship to the careers of physical scientists. May not be scheduled by students who have received credit for PHYS 100, 201, 215, or 221.

PH SC 280 EXPERIMENTAL DESIGN (4) Fundamental statistics, design of experiments and statistical process control with applications to laboratory or manufacturing processes. Prerequisite: MATH 140

PH SC 410 QUANTUM MECHANICS OF ATOMS, MOLECULES, AND SOLIDS (3) The physical concepts underlying the properties of materials are covered. Quantum mechanics is applied to problems in atomic, molecular, and solid- state physics. Prerequisite: PHYS 237

PH SC 440 APPLIED SOLID STATE AND OPTICAL PROCESSES (3) This course covers the solid state physics and material science prerequisite to understand today microelectronic and optoelectronic devices. Prerequisite: PHYS 237, PH SC 410 or PHYS 410

PH SC 450 MICRO-AND NANODEVICES (3) This course provides a overview of the microelectronic, optoelectronic and micro mechanical devices and operating principles behind today's micro and nanoscale technology. Prerequisite: PH SC 440 permission of the program

PHYSICAL THERAPY (P T)

Berks-Lehigh Valley College; Commonwealth College

P T 100 PHYSICAL THERAPIST ASSISTANT—INTRODUCTION (3) Orientation to the field of physical therapy, historical background of the profession, professional ethics, medical terminology, and patient transportation techniques.

P T 101 INTRODUCTION TO COMPUTER SKILLS FOR THE PTA (1) Introduction to basic computer skills for the physical therapist assistant.

P T 150 PHYSICAL THERAPIST ASSISTANT PROCEDURES I (2) General considerations for basic physical therapy modalities including their indications, contraindications, skill development and practical application. Prerequisite: BIOL 129, P T 100, P T 384

P T 160 THERAPEUTIC EXERCISE I (3) Introduction to the principles of exercise in the treatment of disease and injury. Prerequisite: BIOL 129, P T 100, P T 384

P T 201 LICENSURE PREPARATION FOR THE PTA (1) Preparation for the national PTA licensure examination.

P T 202 PEDIATRIC PT (1) A study of physical therapy as it applies to pediatric patients. Prerequisite: P T 100, P T 384

P T 203 THE REHABILITATION OF THE LOWER EXTREMITY AMPUTEE (1) Students will be introduced to the rehabilitation process involved with a patient who has a lower extremity amputation. Prerequisite: P T 100, P T 384

P T 204 SEMINAR IN PHYSICAL THERAPY (1) Specialized physical therapy topics investigated in the framework of clinic visitations and presentations by clinical experts.
P T 205 HUMAN MUSCULATURE (1) Comprehensive review of Human Musculature. Prerequisite: P T 100, P T 384, BIOL 129
P T 250 PHYSICAL THERAPIST ASSISTANT—PROCEDURES II (4) General considerations for advanced physical therapy modalities including their indications, contraindications, skill development and practical application. Prerequisite: BIOL 141, BIOL 142, P T 150, P T 270, P T 384
P T 260 THERAPEUTIC EXERCISE—II (3) Advanced principles of exercise in the treatment of disease and injury. Prerequisite: BIOL 141, BIOL 142, P T 160, P T 270, P T 384
P T 270 PATHOPHYSIOLOGY (3) Introduction to medical and post-operative conditions and/or disease states most frequently treated by physical therapy modalities. Prerequisite: P T 384
P T 270W PATHOPHYSIOLOGY (3) Introduction to the study of disease and those conditions most often treated by physical therapy methods; basic signs, symptoms, and causes of disease and conditions will be covered. Prerequisite: P T 384
P T 280 REHABILITATION (4) Examination of techniques and laboratory experiences in rehabilitation techniques for the physically challenged. Prerequisite: BIOL 141, BIOL 142, P T 150, P T 160, P T 270 or P T 270W, P T 384
P T 280W REHABILITATION (4) Examination of techniques and laboratory experiences in rehabilitation techniques for the physically challenged. Prerequisite: BIOL 141, BIOL 142, P T 150, P T 160, P T 270, P T 384
P T 296 INDEPENDENT STUDIES (1–18)
P T 297 SPECIAL TOPICS (1–9)
P T 384 APPLIED KINESIOLOGY (4) Study of anatomical structure, body movement. Characteristic muscle action and motion will be analyzed in relation to physical therapy context. Prerequisite: BIOL 129, P T 100
P T 395E PHYSICAL THERAPIST ASSISTANT—PRACTICUM I (4) The practice of physical therapist assistant skills in a clinical setting under the direct supervision of a physical therapist. Prerequisite: BIOL 141, BIOL 142, P T 150, P T 160, P T 250, P T 260, P T 270 or P T 270W, P T 280 or P T 280W, P T 384
P T 395F PHYSICAL THERAPIST ASSISTANT—PRACTICUM II (4) The practice of physical therapist assistant skills in a clinical setting under the direct supervision of a registered physical therapist. Prerequisite: P T 150, P T 160, P T 250, P T 260, P T 280, P T 395E or P T 395W
P T 395G PHYSICAL THERAPIST ASSISTANT—PRACTICUM III (4) The practice of physical therapist assistant skills in a clinical setting under the direct supervision of a registered physical therapist. Prerequisite: P T 150, P T 160, P T 250, P T 260, P T 280
P T 395W PHYSICAL THERAPIST ASSISTANT—PRACTICUM I (4) The practice of physical therapist assistant skills in a clinical setting under the direct supervision of a physical therapist. Prerequisite: BIOL 141, BIOL 142, P T 384

PHYSICS (CPHYS)

Capital College

CPHYS 251 SELECTED TOPICS IN PHYSICS (4) Selected topics from the fields of light, magnetism, electricity, and modern physics. Prerequisite: CMATH 221 or MATH 141
CPHYS 351 INTRODUCTION TO MODERN PHYSICS (4) Atomic and molecular theory, relativity, elementary particles, nuclear structure and reactions. Prerequisite: E MCH 011, E T 301, or E T 321; CPHYS 251
CPHYS 497 SPECIAL TOPICS (1–9)

PHYSICS (PHYBD)

Penn State Erie, The Behrend College

PHYBD 097, 197, 297, 397. 497 SPECIAL TOPICS (1–9)
PHYBD 205 PHYSICS PRACTICUM (1) Practicum in physics to complement Phys. 203. Prerequisite: PHYS 202. Prerequisite or concurrent: PHYS 203
PHYBD 296, 496 INDEPENDENT STUDIES (1–18)
PHYBD 400 INTERMEDIATE ELECTRICITY AND MAGNETISM (3) Electrostatics; currents; magnetic fields; electric and magnetic properties of matter; magnetic flux; Maxwell's equations; boundary-value problems; and wave propagation. Prerequisite: MATH 230, MATH 251, PHYS 212, PHYS 213, PHYS 214
PHYBD 402 ELECTRONICS FOR SCIENTISTS (4) DC and AC circuits; signals, filters and amplifiers; (pn) junctions and diodes; transistor circuits; operational amplifiers; digital circuits. Prerequisite: PHYS 212, PHYS 214
PHYBD 410 INTRODUCTION TO QUANTUM MECHANICS (3) Basic postulates of quantum mechanics; Schrodinger equation; approximation methods; angular momentum and spin; scattering theory. Prerequisite: MATH 230, MATH 251, PHYS 237
PHYBD 412 SOLID STATE PHYSICS (3) Crystal structure; reciprocal lattice; X-ray diffraction; lattice vibrations; thermal properties; free electron gas model; energy bands; semiconductors; magnetism. Prerequisite: MATH 230, PHYS 237
PHYBD 419 THEORETICAL MECHANICS (3) Newtonian theory; energy; Lagrangians; Hamiltonians; momentum; collisions; scattering; angular momentum; particle systems; rigid bodies; accelerated frames; gravitation. Prerequisite: MATH 230, MATH 251, PHYS 214

PHYBD 420 THERMAL PHYSICS (3) Thermodynamics and statistical mechanics, temperature; state equations; heat; work; first law; second law; potentials; applications; kinetic theory. Prerequisite: MATH 230, PHYS 213
PHYBD 421W RESEARCH METHODS IN PHYSICS (3) Methodology focusing on the theory of measurement and experiment design. Prerequisite: PHYS 237
PHYBD 444 THE YEAR IN PHYSICS: A SEMINAR ON THE LATEST RESEARCH (1) Discussion recent research in physics. Prerequisite: PHYS 211
PHYBD 445 NANOSCIENCE SEMINAR (1) Advanced nanoscience seminar required of Behrend College students for completion of the nanoscience minor. Prerequisite: CHEM 013, E SC 211, E SC 212, E SC 213, E SC 214, E SC 215, E SC 216, MATH 140, PHYS 211 or PHYS 250
PHYBD 458 INTERMEDIATE OPTICS (4) Geometrical and physical optics; lenses; optical instruments; wave equations; dielectrics; optical properties of materials; interference; diffraction; coherence; polarization; lasers. Prerequisite: PHYS 214
PHYBD 462 INTRODUCTION TO LIQUID CRYSTALS AND POLYMER MATERIALS (3) Physics and chemistry of liquid crystals and polymers. Prerequisite: PHYS 237
PHYBD 494 PHYSICS RESEARCH PROJECT (1–12) Investigation of an original research problem, including a literature search. Preparation of a formal thesis is optional.
PHYBD 495 INTERNSHIP (1–18)

PHYSICS (PHYS)

Eberly College of Science

PHYS 001 (GN) THE SCIENCE OF PHYSICS (3) Historical development and significance of major concepts, with emphasis on the nature of physics and its role in modern life. (For students in non- mathematical fields.)
PHYS 097 SPECIAL TOPICS (1–9)
PHYS 150 (GN) TECHNICAL PHYSICS I (3) Elementary treatment of topics in mechanics, heat, wave motion, and sound leading toward an understanding of technical applications. Prerequisite: 1 1/2 units of algebra. Prerequisite or concurrent: MATH 021, MATH 081, or MTHBD 091
PHYS 150L (GN) TECHNICAL PHYSICS I (3) Elementary treatment of topics in mechanics, heat, wave motion, and sound leading toward an understanding of technical applications.
PHYS 150P (GN) TECHNICAL PHYSICS I (3) Elementary treatment of topics in mechanics, heat, wave motion, and sound leading toward an understanding of technical applications.
PHYS 151 (GN) TECHNICAL PHYSICS II (3) Elementary treatment of topics in electricity, light, and modern physics leading toward an understanding of technical applications. Prerequisite: PHYS 150
PHYS 151L (GN) TECHNICAL PHYSICS (3) Elementary treatment of topics in electricity, light, and modern physics leading toward an understanding of technical applications.
PHYS 151P TECHNICAL PHYSICS (3) Elementary treatment of topics in electricity, light, and modern physics leading toward an understanding of technical applications.
PHYS 199 (GI) FOREIGN STUDIES (1–12)
PHYS 211 (GN) GENERAL PHYSICS: MECHANICS (4) Calculus-based study of the basic concepts of mechanics: motion, force, Newton's laws, energy, collisions, and rotation. Concurrent: MATH 140
PHYS 211L (GN) GENERAL PHYSICS: MECHANICS (4) Calculus-based study of the basic concepts of mechanics: motion, force, Newton's laws, energy, collisions, and rotation. NOTE: UP offers for 0 credits; Altoona offers for 4 credits. Concurrent: MATH 140
PHYS 211P GENERAL PHYSICS: MECHANICS Calculus-based study of the basic concepts of mechanics: motion, force, Newton's laws, energy, collisions, and rotation. Concurrent: MATH 140
PHYS 211R (GN) GENERAL PHYSICS: MECHANICS (4) Calculus-based study of the basic concepts of mechanics: motion, force, Newton's laws, energy, collisions, and rotation. Concurrent: MATH 140
PHYS 212 (GN) GENERAL PHYSICS: ELECTRICITY AND MAGNETISM (4) Calculus-based study of the basic concepts of electricity and magnetism. Prerequisite: MATH 140, PHYS 211 Concurrent: MATH 141
PHYS 212L (GN) GENERAL PHYSICS: ELECTRICITY AND MAGNETISM (4) Calculus-based study of the basic concepts of electricity and magnetism. NOTE: UP offers for 0 credits; Altoona offers for 4 credits. Prerequisite: MATH 140, PHYS 211 Concurrent: MATH 141
PHYS 212P GENERAL PHYSICS: ELECTRICITY AND MAGNETISM Calculus-based study of the basic concepts of electricity and magnetism. Prerequisite: MATH 140, PHYS 211 Concurrent: MATH 141
PHYS 212R (GN) GENERAL PHYSICS: ELECTRICITY AND MAGNETISM (4) Calculus-based study of the basic concepts of electricity and magnetism. Prerequisite: MATH 140, PHYS 211 Concurrent: MATH 141
PHYS 213 (GN) GENERAL PHYSICS: FLUIDS AND THERMAL PHYSICS (2) Calculus-based study of the basic concepts of fluids and sound, heat, kinetic theory, and entropy. Prerequisite: MATH 140, PHYS 211 Concurrent: MATH 141
PHYS 213L (GN) GENERAL PHYSICS: FLUIDS AND THERMAL PHYSICS Calculus-based study of the basic concepts of fluids and sound, heat, kinetic theory, and entropy. Prerequisite: MATH 140, PHYS 211 Concurrent: MATH 141
PHYS 213R (GN) GENERAL PHYSICS: FLUIDS AND THERMAL PHYSICS (2) Calculus-based study of the basic concepts of fluids and sound, heat, kinetic theory, and entropy. Prerequisite: MATH 140, PHYS 211 Concurrent: MATH 141

PHYS 214 (GN) GENERAL PHYSICS: WAVE MOTION AND QUANTUM PHYSICS (2) Calculus-based study of the basic concepts of wave motion, geometrical optics, interference phenomena, photons, wave mechanics, and the structure of matter. Prerequisite: MATH 141, PHYS 211 and PHYS 212
PHYS 214L (GN) GENERAL PHYSICS: WAVE MOTION AND QUANTUM PHYSICS Calculus-based study of the basic concepts of wave motion, geometrical optics, interference phenomena, photons, wave mechanics, and the structure of matter. Prerequisite: MATH 141, PHYS 211 and PHYS 212 Concurrent: MATH 141
PHYS 214R (GN) GENERAL PHYSICS: WAVE MOTION AND QUANTUM PHYSICS (2) Calculus-based study of the basic concepts of wave motion, geometrical optics, interference phenomena, photons, wave mechanics, and the structure of matter. Prerequisite: MATH 141, PHYS 211 and PHYS 212 Concurrent: MATH 141
PHYS 237 INTRODUCTION TO MODERN PHYSICS (3) Relativity and quantum theory applied to selected topics in atomic, molecular, solid state, and nuclear physics. Prerequisite: PHYS 202 or PHYS 212 Concurrent: PHYS 203 or PHYS 204 or PHYS 214
PHYS 237L INTRODUCTION TO QUANTUM PHYSICS (3) Relativity and quantum theory applied to selected topics in atomic, molecular, solid state, and nuclear physics.
PHYS 237R INTRODUCTION TO QUANTUM PHYSICS Relativity and quantum theory applied to selected topics in atomic, molecular, solid state, and nuclear physics.
PHYS 250 (GN) INTRODUCTORY PHYSICS I (4) Selected topics in mechanics, heat, and sound. Prerequisite: MATH 022, MATH 026; or MATH 040; or MATH 041 or satisfactory performance on the mathematics proficiency examination
PHYS 250L (GN) INTRODUCTORY PHYSICS I (4) Selected topics in mechanics, heat, and sound. Prerequisite: MATH 022, MATH 026; or MATH 040; or MATH 041 or satisfactory performance on the mathematics proficiency examination
PHYS 250P (GN) INTRODUCTORY PHYSICS I Selected topics in mechanics, heat, and sound. Prerequisite: MATH 022, MATH 026; or MATH 040; or MATH 041 or satisfactory performance on the mathematics proficiency examination
PHYS 250R (GN) INTRODUCTORY PHYSICS I (4) Selected topics in mechanics, heat, and sound. Prerequisite: MATH 022, MATH 026; or MATH 040; or MATH 041 or satisfactory performance on the mathematics proficiency examination
PHYS 251 (GN) INTRODUCTORY PHYSICS II (4) Selected topics in light, electricity, and magnetism. Prerequisite: PHYS 250
PHYS 251L (GN) INTRODUCTORY PHYSICS II (4) Selected topics in light, electricity, and magnetism. Prerequisite: PHYS 250
PHYS 251P (GN) INTRODUCTORY PHYSICS II Selected topics in light, electricity, and magnetism. Prerequisite: PHYS 250
PHYS 251R (GN) INTRODUCTORY PHYSICS II (4) Selected topics in light, electricity, and magnetism. Prerequisite: PHYS 250
PHYS 255 (GN) PHYSICS OF MUSIC AND SPEECH (3) Descriptive study of vibration and sound waves, hearing and speech, musical instruments, physical bases of harmony and scales.
PHYS 296 INDEPENDENT STUDIES (1–18)
PHYS 297 SPECIAL TOPICS (1–9)
PHYS 399 (GI) FOREIGN STUDIES (1–12)
PHYS 400 INTERMEDIATE ELECTRICITY AND MAGNETISM I (3) Electrostatics, steady-state magnetic field; electrical and magnetic properties of matter; Maxwell's equations, boundary-value problems, and wave propagation. Prerequisite: MATH 250 or MATH 251; PHYS 212, PHYS 213, and PHYS 214; or PHYS 204 Concurrent: MATH 230 OR MATH 231; PHYS 204
PHYS 401 INTERMEDIATE ELECTRICITY AND MAGNETISM II (3) Electromagnetic wave propagation in media, wave guides, dipole radiation, electrodynamics of charged particles, special theory of relativity, special topics. Prerequisite: PHYS 400
PHYS 402 ELECTRONICS FOR SCIENTISTS (4) Circuit and network theory; active devices; amplifiers; introduction to digital electronics; noise theory. Prerequisite: MATH 250 or MATH 251; PHYS 212, PHYS 213, and PHYS 214; or PHYS 204
PHYS 406 SUBATOMIC PHYSICS (3) Introductory treatment of elementary particles, fundamental strong and electroweak interactions, nuclear structure, accelerators, particle detection, nuclear astrophysics. Prerequisite: PHYS 410
PHYS 410 INTRODUCTION TO QUANTUM MECHANICS I (4) Basic postulates; Schrodinger wave equation; stationary states; variational method; scattering in one dimension; orbital angular momentum; hydrogen atom; numerical methods. Prerequisite: MATH 250 OR MATH 251; PHYS 237
PHYS 411 INTRODUCTION TO QUANTUM MECHANICS II (3) General theory of angular momentum; approximation methods; scattering theory; radiation theory; applications to atomic, molecular, condensed matter, nuclear and particle physics. Prerequisite: PHYS 410
PHYS 412 SOLID STATE PHYSICS I (3) Crystal symmetry, x-ray structure analysis, lattice vibrations, thermal properties, free electron transport theory, elementary one-electron quantum theory of solids. Prerequisite: MATH 230 or MATH 231 Concurrent: PHYS 410

PHYS 413 SOLID STATE PHYSICS II (3) Quantum theory of electronic and optical properties of solids, semiconductors, dielectrics, magnetic properties, crystal imperfections, low- temperature effects, and superconductivity. Prerequisite: PHYS 412
PHYS 419 (MATH) THEORETICAL MECHANICS (3) Principles of Newtonian, Lagrangian, and Hamiltonian mechanics of particles with applications to vibrations, rotations, orbital motion, and collisions. Prerequisite: MATH 230 or MATH 231; MATH 250 or MATH 251; PHYS 212, PHYS 213, and PHYS 214; or PHYS 203 or PHYS 204
PHYS 420 THERMAL PHYSICS (3) Basic postulates of statistical mechanics and thermodynamics, microscopic quantum states and macroscopic parameters; partition functions; Maxwell- Boltzmann and quantum statistics. Prerequisite: MATH 231, PHYS 237
PHYS 443 INTERMEDIATE ACOUSTICS (3) Vibration and simple vibrating systems, sound wave propagation, acoustic instruments, recent developments. Prerequisite: MATH 251, PHYS 212, PHYS 213, and PHYS 214; or PHYS 203 or PHYS 204
PHYS 444 TOPICS IN CONTEMPORARY PHYSICS (2) Lectures on research areas of current interest to the physics community. Prerequisite: 9 credits of physics at the 400 level Concurrent: PHYS 410
PHYS 457 EXPERIMENTAL PHYSICS (1–3) Selected experiments in various fields of physics. Prerequisite: PHYS 203 or PHYS 204; or PHYS 212, PHYS 213, and PHYS 214
PHYS 457W EXPERIMENTAL PHYSICS (3) Selected experiments in various fields in physics. Prerequisite: PHYS 203 or PHYS 204; or PHYS 212, PHYS 213, and PHYS 214
PHYS 458 INTERMEDIATE OPTICS (4) Geometrical and physical optics: theory of lens systems, aberrations, apertures, interference, diffraction, polarization. Prerequisite: PHYS 204; or PHYS 212, PHYS 213, and PHYS 214
PHYS 461 (MATH) THEORETICAL MECHANICS (3) Continuation of Math.(Phys.) 419. Theoretical treatment of dynamics of a rigid body, theory of elasticity, aggregates of particles, wave motion, mechanics of fluids. Prerequisite: MATH 419
PHYS 462 APPLICATIONS OF PHYSICS IN MEDICINE (3) Applications of physics in human physiology and in instrumentation for medical diagnosis and treatment. Prerequisite: PHYS 211, PHYS 212, PHYS 213, and PHYS 214; or PHYS 250, PHYS 251
PHYS 496 INDEPENDENT STUDIES (1–18)
PHYS 497 SPECIAL TOPICS (1–9)
PHYS 499 (GI) FOREIGN STUDIES (1–12)

PLANT PATHOLOGY (PPATH)

College of Agricultural Sciences
PPATH 296 INDEPENDENT STUDIES (1–18)
PPATH 297 SPECIAL TOPICS (1–9)
PPATH 318 DISEASES OF FOREST AND SHADE TREES (2) Introduction to diagnosis and control of forest and shade tree diseases.
PPATH 400 PRINCIPLES OF PLANT SCIENCE RESEARCH (2) Fundamental methods in planning research, collecting and recording data, and presenting results in written and oral form.
PPATH 405 MICROBE-PLANT INTERACTIONS: PLANT DISEASE AND BIOLOGICAL CONTROL (3) Survey of microbe-plant interactions causing plant disease, mechanisms of pathogenesis, disease control, and microbial and molecular biological control strategies. Prerequisite: BIOL 110
PPATH 416 MYCOLOGY AND PLANT VIROLOGY: MOLECULES TO POPULATIONS (2–4) A combination course exploring the molecular biology, ecology, and pathology of fungi and plant viruses. Prerequisite: BIOL 110, BIOL 120
PPATH 417 BACTERIA AND ABIOTIC STRESS CAUSING PLANT DISEASES (2–4) The biology of plant pathogenic bacteria, the diseases they cause and their control, and the impact of pollutants on vegetation. Prerequisite: BIOL 110, BIOL 120
PPATH 419 BACTERIA AND NEMATODES CAUSING PLANT DISEASES (2–4) The biology of plant pathogenic bacteria, nematodes, the diseases they cause, and their control. Prerequisite: BIOL 110, BIOL 120
PPATH 424 (BIOL;S T S) SEEDS OF CHANGE: THE USES OF PLANTS (3) Interdisciplinary approach to the biology, chemistry, history, and culture of interactions between plants and people. Prerequisite: BIOL 110; BIOL 220W, BIOL 230W, or BIOL 240W
PPATH 425 (BIOL) BIOLOGY OF FUNGI (4) A survey of the biological diversity of fungi, stressing evolution, ecology, disease, morphology, life histories, and importance to humans. Prerequisite: fifth-semester or graduate standing in a biological sciences major, with six credits completed in the major
PPATH 426 PLANT PATHOGENIC FUNGI (3) Ecology, taxonomy of fungi parasitic on plants, with emphasis on the Fungi Imperfecti; techniques of isolation, pure culture, and identification. Prerequisite: PPATH 405
PPATH 427 MYCOTOXINS: EFFECTS OF FUNGAL TOXINS ON HUMAN AND ANIMAL HEALTH (3) Description and history of mycotoxicoses. Mycotoxin formation, occurrence, control, economic and social impacts, and regulatory issues. Prerequisite: BIOL 110 or BIOL 011 and BIOL 012; CHEM 01, CHEM 015; course can also be taken with approval of the department
PPATH 496 INDEPENDENT STUDIES (1–18)
PPATH 497 SPECIAL TOPICS (1–9)

PLASTICS ENGINEERING TECHNOLOGY (PL ET)

Penn State Erie, The Behrend College

PL ET 050 COMPUTER APPLICATIONS FOR PLASTICS ENGINEERING TECHNOLOGY (3) Programming, spreadsheets for the solution of technical problems, internet access for background and support information, formatting professional reports, creating presentations.

PL ET 097 SPECIAL TOPICS (1–9)

PL ET 098 SPECIAL TOPICS (1–9)

PL ET 197 SPECIAL TOPICS (1–9)

PL ET 198 SPECIAL TOPICS (1–9)

PL ET 205 INTRODUCTION TO PLASTICS (3) Introduction to the plastics industry including fundamental aspects of plastic materials and processing; introduces the chemical influence on mechanical and flow properties of plastic materials. Prerequisite: MATH 040, MATH 082, MATH 140, or MTHBD 091. Prerequisite or concurrent: CHEM 012

PL ET 206 PLASTIC MATERIALS AND PROPERTIES (3) Coverage of the most common commercial plastics including their additives, fillers, and fibers; includes common physical tests used to determine material characteristics. Prerequisite: MCH T 213, PL ET 205

PL ET 206W PLASTIC MATERIALS AND PROPERTIES (3) Coverage of the most common commercial plastics including their additives, fillers, and fibers; includes common physical tests used to determine material characteristics; writing intensive. Prerequisite: MCH T 213, PL ET 205

PL ET 217 PLASTICS PROCESSING I (3) The course provides a fundamental understanding of plastics processing emphasizing injection molding. The complex interdependence between process, the machine, plastic materials, tooling, and part design are stressed. Prerequisite: OR CONCURRENT: PL ET 234

PL ET 234 PRINCIPLES OF PLASTICS PROCESSING EQUIPMENT (4) Mechanical, hydraulic/pneumatic, and electrical aspects of plastic processing equipment will be studied. Prerequisite: MCH T 111 PREREQUISITE OR CONCURRENT: PL ET 205

PL ET 270 PLASTICS PROCESSING II (3) Advanced issues in plastics processing, such as design of experiment and SPC/SQC will be covered. Plant tours will be used to cover issues such as plant layout and operations. Prerequisite: PL ET 217. PREREQUISITE OR CONCURRENT: Q C 200

PL ET 296 INDEPENDENT STUDIES (1–18)

PL ET 297 SPECIAL TOPICS (1–9)

PL ET 310 ORIENTATION TO PLASTICS INDUSTRY (3) Introduction to the various plastic resin groups and related production processes. Prerequisite: CHEM 012

PL ET 340 MOLD DESIGN AND PROCESS STRATEGIES (3) Overview of mold design and the development of strategies and techniques integrating CAD and CAE technologies for optimizing part quality, moldability, and productivity. Prerequisite: METBD 111, PL ET 206, PL ET 217

PL ET 350 DESIGN OF PLASTIC PARTS (4) Designing plastic parts utilizing CAD, FEA, and CAE technologies for the design and for structural, dimensional, and process evaluation and optimization. Prerequisite: MCH T 213, METBD 307, PL ET 340. Prerequisite or concurrent: METBD 317

PL ET 366 FLUID AND THERMAL SCIENCES (4) Fundamental principles of thermodynamics, fluid mechanics, and heat transfer with applications to the plastics industry. Intended for plastics engineering technology students. Prerequisite: PL ET 234. PREREQUISITE OR CONCURRENT: MTHBD 210

PL ET 370 ADVANCED PROCESSING (3) In-depth studies and laboratory experiments will be conducted on processes such as blow molding, rotational molding, thermoforming, compression molding, calendaring, and various assembly operations. Prerequisite: CHMBD 202, PL ET 270. PREREQUISITE OR CONCURRENT: Q C 200

PL ET 397 SPECIAL TOPICS (1–9)

PL ET 400 PLASTICS MANAGEMENT ISSUES (3) Study of business management topics as they relate to the plastics industry. Prerequisite: PL ET 350, PL ET 370

PL ET 400W PLASTICS MANAGEMENT ISSUES (3) Study of business management topics as they relate to the plastics industry. Writing intensive. Prerequisite: PL ET 350, PL ET 370

PL ET 429 PLASTICS PACKAGING (3) Introduction to plastics packaging including production methods, economic concerns, aesthetics, color and transparency, environmental concerns, and package lifetimes. Prerequisite: PL ET 350

PL ET 440 ADVANCED MOLD DESIGN TECHNOLOGIES (4) This is the second course in mold design; focuses on mechanical aspects of designing and building a mold; includes CAD, CAM, and CAE technologies. Prerequisite: MCH T 213, METBD 306, METBD 366, PL ET 340

PL ET 460 ADVANCED COMPUTER APPLICATIONS IN PLASTICS DESIGN (3) Advanced applications of computer-aided design, computer-aided manufacturing, computer-aided engineering, and finite element analysis to plastic product development. Prerequisite: PL ET 350. PREREQUISITE OR CONCURRENT: PL ET 440

PL ET 475 SURVEY OF NEW PLASTICS PROCESSING TECHNOLOGIES (3) Study of the latest trends and advances in plastics processing. Prerequisite: PL ET 370, PL ET 440

PL ET 494A PLASTICS PROJECTS (1–12) Supervised student activities on research and/or design projects identified on an individual or small group basis. A specific title may be used in each instance and will be entered on the student's transcript. Prerequisite or concurrent: METBD 317, PL ET 350, PL ET 370

PL ET 495 INTERNSHIP (1–18) Prerequisite: prior approval of proposed assignment by instructor
PL ET 496 INDEPENDENT STUDIES (1–18)
PL ET 497 SPECIAL TOPICS (1–9)

POLISH (POL)

College of the Liberal Arts

POL 001 BEGINNING POLISH (4) An elementary course to enable the student to achieve a measure of proficiency in reading and speaking Polish.

POL 002 BEGINNING POLISH (4) An elementary course to enable the student to achieve a measure of proficiency in reading and speaking Polish. Prerequisite: POL 001

POL 003 BEGINNING POLISH (4) An elementary course to enable the student to achieve a measure of proficiency in reading and speaking Polish. Prerequisite: POL 002

POL 100 POLISH CULTURE AND CIVILIZATION (3) Survey of Polish culture and civilization from 966 to the present.

POL 197 SPECIAL TOPICS (1–9)

POL 199, 299, 399, 499 (GI) FOREIGN STUDIES (1–12)

POL 395 INTERNSHIP (1–18)

POLITICAL SCIENCE (PL SC)

College of the Liberal Arts

PL SC 001 (GS) INTRODUCTION TO AMERICAN NATIONAL GOVERNMENT (3) Introduction to development and nature of American political culture, constitutional/structural arrangements, electoral/policy processes; sources of conflict and consensus.

PL SC 002 AMERICAN PUBLIC POLICY (3) Examination of selected areas of public policy in America. Analysis of policy content, alternatives, and impact. Prerequisite: PL SC 001

PL SC 003 (GS) INTRODUCTION TO COMPARATIVE POLITICS (3) Introduction to study of comparative government and politics: normative/ empirical theories; government functions in modern societies; representative structures and processes.

PL SC 007 (GS) CONTEMPORARY POLITICAL IDEOLOGIES (3) Critical analysis of contemporary political ideologies such as liberalism, conservatism, socialism, anarchism, fascism, feminism, and environmentalism.

PL SC 014 (GS) INTERNATIONAL RELATIONS (3) Characteristics of modern nation-states and forces governing their international relations; nationalism; imperialism; diplomacy; current problems of war and peace. Credit will not be given for both this course and INT U 200.

PL SC 017 (GS) INTRODUCTION TO POLITICAL THEORY (3) Introduction to basic issues in political theory through analysis of selected major political thinkers.

PL SC 017W (GS) INTRODUCTION TO POLITICAL THEORY (3) Introduction to basic issues in political theory through analysis of selected major political thinkers.

PL SC 020 (GS) COMPARATIVE POLITICS—WESTERN EUROPE (3) Comparative analysis of political cultures, interest groups, parties, and decision-making processes in principal Western European political systems.

PL SC 022 (DF) POLITICS OF THE DEVELOPING AREAS (3) The impact of colonialism, nationalism, and development policy on the political culture, structure, and transformation of post-colonial regimes.

PL SC 083S (GS) FIRST-YEAR SEMINAR IN POLITICAL SCIENCE (3) Exploration of current topics of interest in political science, international relations and/or political theory.

PL SC 117 (GS) CONTEMPORARY POLITICAL IDEOLOGIES (3) Critical analysis of contemporary political ideologies such as liberalism, conservatism, socialism, anarchism, fascism, feminism, and environmentalism.

PL SC 125 PENNSYLVANIA GOVERNMENT AND POLITICS (3) Pennsylvania political processes; executive, legislative, judicial decision- making, and electoral behavior; selected public policies.

PL SC 130 AMERICAN POLITICAL CAMPAIGNS AND ELECTIONS (3) Methods and strategies of American political campaigns: polls, political consultants, parties, and the media.

PL SC 134 (GN) (AGECO) SUSTAINABLE AGRICULTURE SCIENCE AND POLICY (3) The science, economics, and politics of managing food production systems; current practices and options for the future.

PL SC 135 (GS) (S T S) THE POLITICS OF THE ECOLOGICAL CRISIS (3) The political implications of the increasing scarcity of many of the world's resources.

PL SC 137 UNITED STATES INTELLIGENCE AND POLICY MAKING (3) The policy making process in the United States foreign intelligence and security policy; emphasis on the period following World War II.

PL SC 145 (DF) THE UNITED STATES AND ASIA (3) An analysis of changing American strategic, political, and economic interests in Asia and the changing power relationships in the region.

PL SC 150 (DF) THE NORTH-SOUTH CHALLENGE (3) Analysis of issues which separate the Northern and Southern hemispheres, and their importance for U.S. relations with the Third World.

PL SC 155 UNDERSTANDING TYRANNY (3) Exploration of the rationales, methods, and consequences of highly repressive political regimes through novels, films, and memoirs.

PL SC 187 POLITICAL SCIENCE FRESHMAN SEMINAR (3) The meaning and advantages of a Liberal Arts education in context of a specific discipline.
PL SC 197 SPECIAL TOPICS (1–9)
PL SC 199 (GI) FOREIGN STUDIES (1–12)
PL SC 294 RESEARCH PROJECT (1–12)
PL SC 296 INDEPENDENT STUDIES (1–18)
PL SC 297 SPECIAL TOPICS (1–9)
PL SC 299 (GI) FOREIGN STUDIES (1–12)
PL SC 300H HONORS SEMINAR: CRITICAL REASONING IN THE STUDY OF POLITICS (3) An introduction to the conceptual tools and cognitive skills of inquiry in political science.
PL SC 301 INTRODUCTION TO POLITICAL ANALYSIS (3) An introduction to the discipline, subject matter, and methods of political science. Prerequisite: PL SC 001, PL SC 003, or PL SC 014
PL SC 305H INTRODUCTION TO INDEPENDENT THESIS RESEARCH (3) Introduction to research design, principles of social science research, and development on honors theses research proposal.
PL SC 306H SENIOR THESIS WRITING WORKSHOP (1–2) This seminar supports the writing and editing of senior honors theses.
PL SC 395 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
PL SC 399 (GI) FOREIGN STUDIES (1–12)
PL SC 403 THE LEGISLATIVE PROCESS (3) Analysis of the policy process within the legislative system; the effects of environmental factors on policy alternatives and legislative decision making. Prerequisite: PL SC 001 or PL SC 003
PL SC 405 THE AMERICAN PRESIDENCY (3) An examination of the selection methods for, and powers of, the American presidency, as well as other chief executives. Prerequisite: PL SC 001
PL SC 408 INTRODUCTION TO POLITICAL RESEARCH (3) Introduction to conceptualization, research design, and measurement in political research. Prerequisite: 6 credits in political science
PL SC 409 QUANTITATIVE POLITICAL ANALYSIS (3) Data analysis and statistical applications in political research, including data processing; inferential statistics; contingency analysis; correlation and regression; multivariate analysis. Prerequisite: 6 credits in Political Science
PL SC 412 INTERNATIONAL POLITICAL ECONOMY (3) The transnational politics of trade, investment, aid, raw materials, and the environment; nation-states, multinational corporations, and the U.N. Prerequisite: PL SC 014
PL SC 413 THE RISE AND FALL OF THE SOVIET UNION (3) Background, organization, and operation of the Communist Party and the government of the Soviet Union. Prerequisite: 3 credits from: PL SC 003, PL SC 014, PL SC 155, or RUS 100
PL SC 414 FOREIGN POLICY OF THE SOVIET UNION (3) Foundations of Soviet foreign policy; general principles and tactics of world Communism; instruments of control; Comintern, Cominform, diplomacy. Prerequisite: 3 credits from: PL SC 003, PL SC 014, PL SC 155, or RUS 100
PL SC 415 INTERNATIONAL ORGANIZATION: POLITICAL AND SECURITY FUNCTIONS (3) Theory and evolution of international organization; political and security functions of the United Nations and regional organizations. Prerequisite: PL SC 014
PL SC 417 AMERICAN LOCAL GOVERNMENT AND ADMINISTRATION (3) Organization, powers, functions, and problems of American cities and metropolitan areas; modern trends and developments. Prerequisite: PL SC 001
PL SC 418 INTERNATIONAL RELATIONS THEORY (3) A survey of traditional and contemporary conceptual frameworks and theoretical approaches for the analysis of international relations. Prerequisite: PL SC 014
PL SC 418W INTERNATIONAL RELATIONS THEORY (3) A survey of traditional and contemporary conceptual frameworks and theoretical approaches for the analysis of international relations. Prerequisite: PL SC 014
PL SC 419 BUREAUCRACY AND PUBLIC POLICY (3) Overview of structural, technological, decision-making, behavioral, and political subsystems of bureaucracy; emphasis on bureaucratic dynamics within larger environmental, interorganizational contexts. Prerequisite: PL SC 001 or PL SC 002
PL SC 420 POLICY MAKING AND EVALUATION (3) Advanced analysis of public policy, emphasizing policy evaluation and the factors that determine policy success and failure. Prerequisite: PL SC 001 or PL SC 002
PL SC 422 COMPARATIVE URBAN POLITICS (3) Relationships between structure and evolution of city systems and patterns of political behavior. Prerequisite: PL SC 003, PL SC 020, PL SC 022, or PL SC 417
PL SC 425 GOVERNMENT AND POLITICS OF THE AMERICAN STATES (3) Comparative analysis of political processes; executive, legislative, and judicial decision making and behavior; examination of systems functioning; selected public policies. Prerequisite: PL SC 001
PL SC 426 POLITICAL PARTIES AND INTEREST GROUPS (3) Interest group basis of American politics, analysis of party and group behavior in electoral politics and the policy process. Prerequisite: PL SC 001
PL SC 427 POLITICAL OPINION (3) Nature and development of mass attitudes and opinions; political socialization; voting behavior; relation between opinions and public policy. Prerequisite: PL SC 001

PL SC 428 (GI) (WMNST) GENDER AND POLITICS (3) Gender in politics in the United States and around the world; major areas of women and politics research. Prerequisite: 6 credits in political science or women's studies

PL SC 430 SELECTED WORKS IN THE HISTORY OF POLITICAL THEORY (3) Detailed examination and analysis of a selected major work, thinker, or tradition in the history of political theory. Prerequisite: PL SC 017 or PL SC 007

PL SC 431 ANCIENT, MEDIEVAL, AND RENAISSANCE POLITICAL THEORIES (3) Political theories of Plato and Aristotle; selected Greek, Roman, medieval, and Renaissance theorists through Machiavelli. Prerequisite: PL SC 017 or PL SC 007

PL SC 432 MODERN AND CONTEMPORARY POLITICAL THEORIES (3) Political theories of the seventeenth through the twentieth centuries, including Hobbes, Locke, Rousseau, Marx, Mill, Mosca, Weber, and selected theorists. Prerequisite: PL SC 017 or PL SC 007

PL SC 435 FOUNDATIONS OF AMERICAN POLITICAL THEORY (3) Political theories of colonial, revolutionary, and constitutional periods presented through works of selected thinkers and analysis of particular political problems. Prerequisite: PL SC 001, PL SC 017, or PL SC 007

PL SC 435W FOUNDATIONS OF AMERICAN POLITICAL THEORY (3) Political theories of the revolutionary and constitutional periods presented through works of selected political thinkers and political issues. Prerequisite: PL SC 001, PL SC 017, or PL SC 007

PL SC 437 WAR IN WORLD POLITICS (3) Causes, resolution, and consequences of crises and wars; testing theories of conflict using both case and statistical studies. Prerequisite: PL SC 014

PL SC 438 NATIONAL SECURITY POLICIES (3) Impact of national security on U.S. government and foreign policy; roles and interaction of President, Congress, government agencies, interest groups. Prerequisite: PL SC 001 or PL SC 014

PL SC 439 (ADM J) THE POLITICS OF TERRORISM (3) Analysis of political terrorism as a violent alternative for peaceful change and traditional warfare in the nuclear age. Prerequisite: ADM J 111, PL SC 014

PL SC 441 TRANSNATIONAL CORPORATIONS AND OTHER ORGANIZATIONS IN INTERNATIONAL REL ATIONS (3) Analysis of the effects of transnational actor behavior on international relations. Prerequisite: ECON 333, I B 303, or PL SC 014

PL SC 442 AMERICAN FOREIGN POLICY (3) Principles of American foreign policy; processes of policy formulation; roles of the President, Congress, the State Department, and other government agencies. Prerequisite: PL SC 014

PL SC 444 GOVERNMENT AND THE ECONOMY (3) Interactions of governmental and economic activity in American life. Survey of governmental (national, state, local) promotional, regulatory, and ownership policies. Prerequisite: 3 credits in political science or economics

PL SC 451 COMPARATIVE POLITICAL ANALYSIS (3) Belief systems, leadership, decision making, public controls, and consensus building in Western and non-Western political societies; problems of methodology. Prerequisite: 3 credits from PL SC 003, PL SC 020, PL SC 022

PL SC 452 GOVERNMENT AND POLITICS OF EASTERN EUROPE (3) Politics and society in the Communist Era, the revolutions of 1989, and problems of adjustment to democracy and market. Prerequisite: PL SC 003, PL SC 020, PL SC 022, or PL SC 155

PL SC 453 POLITICAL PROCESSES IN UNDERDEVELOPED SYSTEMS (3–6) Comparative analysis of the political, social, and economic problems characteristic of underdeveloped systems. Prerequisite: PL SC 003, PL SC 020, or PL SC 022

PL SC 454 (GI) (AAA S) GOVERNMENT AND POLITICS OF AFRICA (3) Contemporary African politics, institutions, and ideologies; patterns of change, social forces, and nation building in selected African states. Prerequisite: 3 credits from: AAA S 110, PL SC 003, PL SC 020, or PL SC 022

PL SC 455 GOVERNMENTS AND POLITICS OF WESTERN EUROPE (3) Comparative analysis of political and governmental structures of major West European nations; main functions and processes of such structures. Prerequisite: PL SC 003 or PL SC 020

PL SC 456 POLITICS AND INSTITUTIONS OF LATIN-AMERICAN NATIONS (3) Social forces and processes, governmental institutions, foreign policies of major states of Latin America. Prerequisite: HIST 179, PL SC 003, PL SC 020, or PL SC 022

PL SC 457 INTERNATIONAL POLITICS OF LATIN AMERICA (3–6) Relationships among the nations of Latin America and the social forces which determine and shape their direction. Prerequisite: HIST 179, PL SC 003, PL SC 014, PL SC 020, or PL SC 022

PL SC 458 GOVERNMENT AND POLITICS OF EAST ASIA (3–6) Examination of political institutions, democratic and communist revolution, political leadership, political processes of major states of East Asia. Prerequisite: 3 credits from PL SC 003, PL SC 020, PL SC 022

PL SC 460 (S T S) SCIENCE, TECHNOLOGY, AND PUBLIC POLICY (3) The all-pervasive importance of science and technology policy in modern societies and mechanisms and processes by which it is made. Prerequisite: 3 credits in natural sciences or engineering, 3 credits in social and behavioral sciences

PL SC 462 MARXIST AND SOCIALIST POLITICAL THEORY (3) Analysis of major problems and key works in the Marxist and Socialist tradition; dialectical materialism, alienation, class warfare, etc. Prerequisite: PL SC 017, PL SC 007, PL SC 413, or PL SC 452

PL SC 466 COMPARATIVE FOREIGN POLICIES OF WESTERN EUROPE (3) Comparative analysis of Western European nations' foreign policies; national roles in NATO, EEC, and other regional organizations. Prerequisite: PL SC 014 or PL SC 020

PL SC 467 INTERNATIONAL RELATIONS OF THE MIDDLE EAST (3) The international relations of the Middle East, stressing national security policies of regional and outside actors, and major contemporary conflicts. Prerequisite: PL SC 014 or HIST 181
PL SC 468 INTERNATIONAL RELATIONS OF EAST ASIA (3) Analyzes international relations in East Asia since 1945; focuses on changes in alignment, interactions among China, U.S., U.S.S.R., and Japan. Prerequisite: PL SC 014
PL SC 470W LEGAL BRIEF WRITING (3) Writing of legal briefs as practiced in American courts. Prerequisite: PL SC 001
PL SC 471 ADMINISTRATIVE LAW (3) Powers and procedures of administrative agencies; rule-making and adjudication; government tort liability. Prerequisite: PL SC 001
PL SC 472 THE AMERICAN LEGAL PROCESS (3) Analysis of the roles, procedures, and policies characterizing the American legal system. Prerequisite: PL SC 001
PL SC 473 CONSTITUTIONAL LAW: THE FEDERAL SYSTEM (3) Analysis of leading American contitutional decisions relating to national legislative, executive, and judicial powers and to the position of the states. Prerequisite: PL SC 001
PL SC 474 CONSTITUTIONAL LAW: EQUAL PROTECTION (3) Analysis of racial, gender, economic, and social discrimination under the 14th Amendment to the United States Constitution. Prerequisite: PL SC 001
PL SC 475 CONSTITUTIONAL LAW: SUBSTANTIVE DUE PROCESS RIGHTS (3) Analysis of liberty, property, and privacy rights in the federal system. Prerequisite: PL SC 001
PL SC 494 RESEARCH PROJECT (1–12)
PL SC 495 POLITICAL SCIENCE INTERNSHIP (1–9) Combining experience in government offices, related agencies, or law firms, with appropriate readings and a research paper/report. Prerequisite: prior consent of supervisor, adviser, or department head; applicable departmental internship requirements such as satisfactory completion of required 300- or 400-level courses appropriate for the internship program selected
PL SC 496 INDEPENDENT STUDIES (1–18)
PL SC 497 SPECIAL TOPICS (1–9)
PL SC 499 (GI) FOREIGN STUDY—GOVERNMENT (1–12) Study, in selected foreign countries, of political institutions. Prerequisite: PL SC 003, 3 credits in economics, history, political science, or sociology

POLITICAL SCIENCE (POLSC)

Penn State Erie, The Behrend College
POLSC 097 SPECIAL TOPICS (1–9)
POLSC 123 (GS;GI) ETHNIC AND RACIAL POLITICS (3) Political movements among United States ethnic and racial groups; government policies on race and ethnicity; comparison to other culturally diverse countries. Prerequisite: PL SC 001 or PL SC 003
POLSC 132 (GS;GI) THE POLITICS OF INTERNATIONAL INTOLERANCE (3) Introductory course emphasizing psychological, historical, and political aspects of global intolerance towards minorities.
POLSC 197 SPECIAL TOPICS (1–9)
POLSC 296 INDEPENDENT STUDIES (1–18)
POLSC 297 SPECIAL TOPICS (1–9)
POLSC 305 COMPARATIVE PUBLIC POLICY (3) Comparative methodology and public policy implementation in postindustrial societies; selected case studies of policy output. Prerequisite: PL SC 003
POLSC 306 INTRODUCTION TO GOVERNMENT MANAGEMENT (3) A survey of the major approaches to the management of most governmental agencies. Prerequisite: PL SC 001
POLSC 397 SPECIAL TOPICS (1–9)
POLSC 401W CONGRESS AND THE PRESIDENCY (3) Basic characteristics and processes of the national legislature and executive; roles and interaction of these institutions in the policy process. Prerequisite: PL SC 001
POLSC 404 PUBLIC OPINION (3) Theory, uses, and measurement of public opinion; the role of public opinion in the U.S. political system; voter attitude survey. Prerequisite: PL SC 001 or PL SC 003
POLSC 406 AMERICAN JUDICIAL BEHAVIOR (3) Analyzes behavior of judges and other participants in the legal process; examines how and why courts function as policymaking bodies. Prerequisite: PL SC 001
POLSC 407 CONSTITUTIONAL LAW (3) The origins of judicial review, landmark decisions of the Supreme Court, and their impact on the American form of government. Prerequisite: PL SC 001
POLSC 408 AMERICAN STATE AND URBAN POLITICS (3) Explores basic characteristics and processes of American state and urban politics; nature of intergovernmental relations involving these governmental levels. Prerequisite: PL SC 001
POLSC 421 THE FAILURE OF COMMUNISM IN EASTERN EUROPE (3) Social, political, and economic development of east European communism; emphasis on the sources of decay and rise of successor regimes. Prerequisite: PL SC 003
POLSC 423 POST-SOVIET POLITICS (3) Aspects of political transition and institutions of the fifteen Soviet successor republics; emphasis on Russia and republican confederation. Prerequisite: PL SC 003
POLSC 424W THE FOREIGN POLICY OF SOVIET SUCCESSOR STATES (3) Relations between Russia and The Newly Independent States (NIS); Russia's relations with selected foreign states and political Institutions; regional impact of the NIS in Baltic, Asian, and Central Asian areas. Prerequisite: PL SC 003

POLSC 428 INTERNATIONAL LAW AND ORGANIZATIONS (3) Major topics and issues of international law with special attention to institutional arrangements (international organizations) through which that law operates. Prerequisite: PL SC 003 or PL SC 014
POLSC 471 PUBLIC POLICY ANALYSIS (3) Methods and techniques of policy analysis; explores the various determinants of policy outputs and evaluates the impact of policy alternatives. Prerequisite: PL SC 001
POLSC 472 PUBLIC POLICY AND THE BUREAUCRATIC STATE (3) Explores basic characteristics and processes of the national bureaucracy and their impact on formulation, implementation, and impact of public policy. Prerequisite: PL SC 001
POLSC 495 INTERNSHIP IN LOCAL GOVERNMENT (1–6) Interns work with public agencies in the Erie metropolitan areas under the supervision of a sponsor and a faculty member. Prerequisite: PL SC 001, PL SC 003
POLSC 496 INDEPENDENT STUDIES (1–18)
POLSC 497 SPECIAL TOPICS (1–9)

POLYMER SCIENCE AND ENGINEERING (PLMSE)

College of Earth and Mineral Sciences
PLMSE 497 SPECIAL TOPICS (1–9)

PORTUGUESE (PORT)

College of the Liberal Arts
PORT 001 ELEMENTARY PORTUGUESE I (4) For beginners. Grammar, with reading and writing of simple Portuguese; oral and aural work stressed.
PORT 002 ELEMENTARY PORTUGUESE II (4) Grammar, reading, and conversation continued; special emphasis on the language, literature, and life of Brazil. Prerequisite: PORT 001
PORT 003 INTERMEDIATE PORTUGUESE (4) Grammar, reading, composition, and conversation. Prerequisite: PORT 002
PORT 187 PORTUGUESE FRESHMAN SEMINAR (3) Prerequisite: first-semester standing and enrollment in the College of the Liberal Arts
PORT 197, 497 SPECIAL TOPICS (1–9)
PORT 199, 299, 399, 499 (GI) FOREIGN STUDIES (1–12)
PORT 294, 494 RESEARCH PROJECT (1–12)
PORT 395 INTERNSHIP (1–18)
PORT 405 ADVANCED COMPOSITION AND CONVERSATION (3) Intended to strengthen the advanced student's ability to speak, read, and write in modern Brazilian Portuguese. Prerequisite: PORT 003
PORT 456 BRAZILIAN LITERATURE IN ENGLISH TRANSLATION (3) Selected topics in the history of Brazilian literature, supplemented by readings, discussion, and lectures on cultural or literary questions.
PORT 466 BRAZILIAN LITERATURE, THE COLONIAL ERA THROUGH ROMANTICISM (3) A survey of the major texts of Brazilian literature from its origins (1500) through its romantic period. Prerequisite: PORT 003
PORT 476 BRAZILIAN LITERATURE, THE MODERN ERA (1880 TO THE PRESENT) (3) A survey of the major texts of Brazilian literature from romanticism to the present. Prerequisite: PORT 003
PORT 480 THE BRAZILIAN NOVEL (3) A survey of the Brazilian novel from its origins to the present. Prerequisite: PORT 003, PORT 405
PORT 496 INDEPENDENT STUDIES (1–18)

PSYCHOLOGY (PSY)

College of the Liberal Arts
PSY 002 (GS) PSYCHOLOGY (3) Introduction to general psychology; principles of human behavior and their applications.
PSY 015 ELEMENTARY STATISTICS IN PSYCHOLOGY (4) Frequency distributions and graphs; measures of central tendency and variability; normal probability curve; elementary sampling and reliability; correlations; simple regression equations. Prerequisite: PSY 002, MATH 021
PSY 083S (GS) FIRST-YEAR SEMINAR IN PSYCHOLOGY (3) Scientific, societal, and individual implications of contemporary psychological theory.
PSY 170 (GS;DF) PSYCHOLOGY OF WOMEN (3) Psychology of women in historical perspective and present evolvement. Stresses women's self-concepts with relation to individual and social psychological health. Prerequisite: PSY 002
PSY 170W (GS) PSYCHOLOGY OF WOMEN (3) Psychology of women in historical perspective and present evolvement. Stresses women's self-concepts with relation to individual and social psychological health. Prerequisite: PSY 002
PSY 197 SPECIAL TOPICS (1–9)
PSY 199 (GI) FOREIGN STUDIES (1–12)
PSY 201W BASIC RESEARCH METHODS IN PSYCHOLOGY (4) Introduction to methods of psychological research, with special attention to hypothesis formation and testing, threats to validity, and data presentation. Prerequisite: PSY 002; PSY 015 or STAT 200

PSY 202 (GS) INTRODUCTION TO PERCEPTION (3) Survey of human perception and processing of perceptual information, with some reference to animal literature. Emphasizes vision and audition. Prerequisite: PSY 002

PSY 203 NEUROLOGICAL BASES OF HUMAN BEHAVIOR (3) An introduction to biopsychology, emphasizing the structure and function of the human brain.

PSY 204 (GS) INTRODUCTION TO LEARNING (3) A general survey of the learning area, including animal and human experiments, with the applicability of learning principles being discussed. Prerequisite: PSY 002

PSY 209 EVOLUTIONARY PSYCHOLOGY (3) Survey of evolutionary perspectives in current psychological research. Prerequisite: PSY 002; ANTH 021, BI SC 002, BIOL 033, or BIOL 222

PSY 213 (GS) INTRODUCTION TO DEVELOPMENTAL PSYCHOLOGY (3) Developmental principles; physical growth; linguistic, intellectual, emotional, and social development from infancy to maturity. Prerequisite: PSY 002

PSY 217 (GS) SOCIAL PSYCHOLOGY (3) Research and theory on topics including interpersonal attraction, aggression, helping, attitudes, attribution, cooperation, competition, and groups, from a psychological perspective. Prerequisite: PSY 002

PSY 221 (GS) INTRODUCTION TO COGNITIVE PSYCHOLOGY (3) Introduction to study of such higher mental processes as thinking and reasoning, imagery, concept formation, problem solving, and skilled performance. Prerequisite: PSY 002

PSY 231 (GS) INDUSTRIAL PSYCHOLOGY (3) Personnel selection, training, accident prevention, morale, and organizational behavior. Prerequisite: PSY 002

PSY 236 (GS) (RL ST) INTRODUCTION TO PSYCHOLOGIES OF RELIGION (3) Introduction to major Western psychologies of religion (James, Freud, Jung) and to subsequent extensions of and departures from them.

PSY 237 (GS) (RL ST) INTRODUCTION TO RELIGIONS, CULTURES, AND THERAPIES (3) Comparison of methods and goals of selected religious and secular therapies within their cultural contexts. Prerequisite: PSY 002

PSY 238 (GS) INTRODUCTION TO PERSONALITY PSYCHOLOGY (3) Past and recent conceptualizations of key issues and root ideas of personality psychology. Prerequisite: PSY 002

PSY 243 (GS) PSYCHOLOGY OF PERSONAL WELL-BEING AND ADJUSTMENT (3) Applying psychological knowledge to develop and maintain effective personal adjustment and well-being and positive social relations. Prerequisite: PSY 002

PSY 270 (GS;GI) INTRODUCTION TO THE PSYCHOLOGY OF GENDER (3) Psychological study of gender in historical and contemporary perspective. Role of gender in development, self-concept, social relations, and mental health. Prerequisite: PSY 002

PSY 294 RESEARCH PROJECT (1–12)

PSY 295 INTERNSHIP (1–18) Supervised off-campus nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.

PSY 296 INDEPENDENT STUDIES (1–18)

PSY 297 SPECIAL TOPICS (1–9)

PSY 299 (GI) FOREIGN STUDIES (1–12)

PSY 300H HONORS COURSE IN PSYCHOLOGY (1–6) Individual study and seminar in selected phases of psychology. Prerequisite: invitation of Departmental Honors Committee

PSY 301A ADVANCED RESEARCH METHODS IN CLINICAL PSYCHOLOGY (3) Advanced methodology focusing on the logic and practice of research in clinical psychology. Prerequisite: PSY 201W

PSY 301B ADVANCED RESEARCH METHODS IN COGNITIVE PSYCHOLOGY (3) Advanced methodology focusing on the logic and practice of research in cognitive psychology. Prerequisite: PSY 201W

PSY 301C ADVANCED RESEARCH METHODS IN DEVELOPMENTAL PSYCHOLOGY (3) Advanced methodology focusing on the logic and practice of research in developmental psychology. Prerequisite: PSY 201W

PSY 301D ADVANCED RESEARCH METHODS IN INDUSTRIAL/ORGANIZATIONAL PSYCHOLOGY (3) Advanced methodology focusing on the logic and practice of research in industrial/organizational psychology. Prerequisite: PSY 201W

PSY 301E ADVANCED RESEARCH METHODS IN PSYCHOBIOLOGY (3) Advanced methodology focusing on the logic and practice of research in psychobiology. Prerequisite: PSY 201W

PSY 301F ADVANCED RESEARCH METHODS IN SOCIAL PSYCHOLOGY (3) Advanced methodology focusing on the logic and practice of research in social psychology. Prerequisite: PSY 201W

PSY 399 (GI) FOREIGN STUDIES (1–12)

PSY 401 ADVANCED RESEARCH METHODS IN PSYCHOLOGY (3) Advanced methodology focusing on the logic and practice of research in a selected content area of psychology. Prerequisite: PSY 201W

PSY 402 SENSATION AND PERCEPTION (3) Fundamental processes and variables involved in the sensory experience of animals and man. Prerequisite: PSY 202 or background in physiology

PSY 404 CONDITIONING AND LEARNING (3) An examination of basic learning processes which have been determined within the context of classical, instrumental, and operant learning situations. Prerequisite: PSY 002

PSY 405 THE EXPERIMENTAL PSYCHOLOGY OF VISUAL PERCEPTION (3) The processes of visual perception; lectures, demonstrations, and experimental investigations.

PSY 407 BEHAVIOR GENETICS (3) Survey of gene mechanisms and gene-environment interactions in the determination of behavior; emphasis on deviant human behavior. Prerequisite: BIOL 033

PSY 408 COMPARATIVE PSYCHOLOGY (3) Behavior from standpoint of phylogenetic growth and development; biological implications; comparison of different types of animals, including man. Prerequisite: PSY 002, PSY 203

PSY 410 HISTORICAL ANTECEDENTS OF PSYCHOLOGY (3) Survey of major antecedents to scientific psychology: philosophical, physiological, and others. Includes establishment of scientific psychology prior to twentieth century. Prerequisite: PSY 002, 3-credit 400-level psychology course

PSY 411 SYSTEMS OF PSYCHOLOGY AND THE RECENT PAST (3) Survey of the development of contemporary psychological theories and research areas from the formal establishment of psychology to the present. Prerequisite: PSY 002, 3-credit 400-level psychology course

PSY 412 ABNORMAL PSYCHOLOGY (3) Causes, dynamics, and symptoms of neuroses, psychoses, behavior disorders, psychosomatic disorders, and mental retardation. Prerequisite: PSY 002

PSY 414 (RL ST) HUMANISTIC, EXISTENTIAL, AND RELIGIOUS APPROACHES TO PSYCHOLOGY (3) Existential, humanistic, and religious approaches to the psychology of experience, consciousness and will. Prerequisite: PSY 002 OR RL ST 001

PSY 415 INTERMEDIATE EXPERIMENTAL DESIGN (3) Design and analysis of experiments on human and animal behavior, including application of the t, F, chi-square, and binomial distributions. Prerequisite: PSY 015 or STAT 200

PSY 417 ADVANCED SOCIAL PSYCHOLOGY (3) In-depth study of selected research areas in human social behavior. Prerequisite: PSY 217

PSY 419 MEASUREMENT AND DECISION MAKING (3) Introduction to axiomatic measurement theory, scale construction, and behavioral decision theory. Algebraic and stochastic models; iterative scaling methods. Prerequisite: MATH 111 or MATH 141; STAT 200

PSY 420 PSYCHOLOGY OF LANGUAGE (3) Overview of psychological research and theory on language processes, including speech perception, word recognition, meaning representation, comprehension, and language acquisition. Prerequisite: PSY 002

PSY 421 ADVANCED COGNITIVE PSYCHOLOGY (3) In-depth study of complex mental processes: thinking, problem solving, imagery, symbolic behavior, information processing, attention, artificial intelligence, and language. Prerequisite: PSY 002, 3-credit 400-level psychology course

PSY 422 VISUAL COGNITION (3) Overview of concepts and methods in cognitive visual-spatial processing. Prerequisite: PSY 002

PSY 423 COGNITIVE DEVELOPMENT (3) Development of thinking, reasoning, problem solving. Prerequisite: PSY 213

PSY 424 SOCIAL AND PERSONALITY DEVELOPMENT (3) Development of social and personality attributes. Prerequisite: PSY 213

PSY 425 TOPICS IN DEVELOPMENTAL PSYCHOLOGY (3) Special topics in developmental psychology. Prerequisite: PSY 423 or PSY 424

PSY 426 ADOLESCENCE (3) Individual and social development from later childhood to adulthood; adolescence as a social phenomenon; guidance in home, school, community. Prerequisite: PSY 002; PSY 015, STAT 200, or EDPSY 400

PSY 430 PSYCHOLOGY OF MEMORY (3) Theory of memory, including its constructive and organizational aspects. Verbal learning, retention, forgetting, and transfer. Prerequisite: PSY 002

PSY 432 INTRODUCTORY ENGINEERING PSYCHOLOGY (3) Methods and results of experimental psychology pertinent to problems which involve man-machine relationships. Prerequisite: PSY 002, STAT 200

PSY 436 MENTAL HEALTH IN SCHOOLS (3) Psychology of personal relationships in school situations. Prerequisite: PSY 002, PSY 213

PSY 437 PSYCHOLOGY OF ADJUSTMENT (3) Development and function of basic adjustive mechanisms; role and problems of adjustment in various social situations. Prerequisite: PSY 002

PSY 438 THEORY OF PERSONALITY (3) General survey of various theories of personality, with emphasis on experimental findings. Prerequisite: PSY 002

PSY 441 INDUSTRIAL MOTIVATION AND WORK SATISFACTION (3) Survey of theory and research with respect to attitudes, morale, and motivation of employees and management. Prerequisite: PSY 002; PSY 015 or STAT 200

PSY 443 PSYCHOLOGY OF HUMAN EMOTION (3) Reviews, critiques, and applies major historical and contemporary psychological theories of emotion experience, understanding, and expression. Prerequisite: PSY 002

PSY 444 ATTENTION AND INFORMATION PROCESSING (3) An examination of attentional processes. Contemporary informational processing approaches will be emphasized. Prerequisite: 3 credits in statistics; 3 credits in 400-level psychology courses

PSY 445 (HD FS) DEVELOPMENT THROUGHOUT ADULTHOOD (3) Processes of development and change of behavior from early adulthood through old age, emphasizing theory, method, and empirical research. Prerequisite: PSY 002; statistics; 6 credits in human development and family studies, psychology, or sociology

PSY 449 INTRODUCTION TO MATHEMATICAL PSYCHOLOGY (3) Formalized psychological theories including models of social, biological, cognitive, and learning phenomena. Prerequisite: MATH 007 or MATH 040; STAT 200

PSY 450 (EDPSY) PRINCIPLES OF MEASUREMENT (3) Scale transformation, norms, standardization, validation procedures, estimation of reliability. Prerequisite: EDPSY 400, PSY 015, or PSY 002; STAT 200

PSY 451 LEADERSHIP IN WORK SETTINGS (3) Review of research and application of behavior principles in the areas of management and supervision. Prerequisite: PSY 231
PSY 456 PSYCHOPHYSIOLOGY (3) Basic theory and procedure for recording and applying autonomic nervous system and other physiological responses.
PSY 461 PERSONNEL TESTING AND INTERVIEWING (3) Background in personnel testing, performance measurement, selection strategies, with emphasis on validity and measurement reliability. Prerequisite: PSY 015 or STAT 200; PSY 231
PSY 470 SOCIAL LEARNING FOUNDATIONS OF BEHAVIOR CHANGE (3) Theory and research in social learning problems. Emphasis on child rearing, classroom management, institutional treatment, personal adjustment.
PSY 471 (GI) (WMNST) THE PSYCHOLOGY OF GENDER (3) Theories and research on gender differences and gender roles. Emphasis on women's and men's current positions in society. Prerequisite: PSY 002, PSY 217
PSY 472 (GI) MULTICULTURAL PSYCHOLOGY IN AMERICA (3) This course focuses on the central role of culture, race, and ethnicity in the human condition. Prerequisite: PSY 002
PSY 473 MENTAL HEALTH PRACTICUM WITH CHILDREN (3) Overview of interventions for children at risk for mental health disorders; emphasis on intervention strategies, program evaluation, and applied skills. Prerequisite: PSY 002
PSY 474 PSYCHOLOGY OF EXCEPTIONAL CHILDREN (3) Etiology, diagnosis, and facilitation of adjustment of the mentally retarded, gifted, physically handicapped, and emotionally disturbed child. Prerequisite: PSY 002, PSY 213
PSY 475 SOCIAL PSYCHOLOGY OF INTERPERSONAL/INTERGROUP RELATIONSHIPS (3) In-depth study of relationships among individuals (e.g., intimate relationships) or groups (e.g., prejudice, cooperation, competition, aggression, and negotiation). Prerequisite: PSY 002, PSY 217
PSY 476 SELF AND SOCIAL JUDGMENT (3) Individual's perceptions, evaluations, and decision-making strategies about themselves, others, and social situations or issues. Prerequisite: PSY 002, PSY 217
PSY 477 APPLIED SOCIAL PSYCHOLOGY (3) Application of social psychological theories and research methods to field settings and to the study of social issues. Prerequisite: PSY 002, PSY 217
PSY 479 (RL ST) RELIGION AND CULTURE IN FREUDIAN THOUGHT (3) Readings, lectures, and discussion on major psychoanalytic claims about individual and cultural mental life, focusing on the theory of religion. Prerequisite: PSY 002
PSY 482 INTRODUCTION TO CLINICAL PSYCHOLOGY (3) Survey of diagnostic and treatment procedures and resources in clinical guidance work with children and adults; professional duties and skills of the clinical psychologist. Prerequisite: PSY 412 or PSY 437
PSY 483 THE PSYCHOLOGY OF FEAR AND STRESS (3) Description and evaluation of major trends in research on stress and fear in humans and other animals. Prerequisite: 3 credits in biology; 3 credits in statistics
PSY 484 CLINICAL NEUROPSYCHOLOGY (3) Overview of functional human neuroanatomy and clinical neuropsychology, with emphasis on origin, assessment, and treatment of human brain damage. Prerequisite: PSY 203
PSY 485 DEVELOPMENTAL BIOPSYCHOLOGY (3) Developmental neuroanatomy and neurophysiology of vertebrates as they relate to behavior; emphasis on early postnatal development of birds and mammals. Prerequisite: PSY 203
PSY 487 HEALTH PSYCHOLOGY (3) Overview of the field with an emphasis on how psychological research contributes to an understanding of health and behavior. Prerequisite: PSY 002
PSY 488 THE ANALYTICAL PSYCHOLOGY OF CARL JUNG (3) The basic theory of Jung's psychology, with emphasis on psychological types, therapy, and structure of the unconscious. Prerequisite: PSY 002
PSY 489 PSYCHOLOGY OF CONSCIOUSNESS (3) Introduction to psychological and physiological aspects of consciousness as related to brain function and clinical psychology. Prerequisite: PSY 002
PSY 493 SENIOR THESIS (3–6) Supervised senior thesis research in psychology. Prerequisite: approval of a thesis adviser in the department, seventh-semester standing
PSY 494 RESEARCH PROJECTS (1–12) Supervised student activities on research projects identified on an individual or small-group basis.
PSY 495 PSYCHOLOGY PRACTICUM (1–15) Undergraduate student observes and works with psychologists in applied setting. Prerequisite: PSY 002, PSY 015, or STAT 200; PSY 201W
PSY 496 INDEPENDENT STUDIES (1–18)
PSY 497 SPECIAL TOPICS (1–9)
PSY 499 (GI) FOREIGN STUDIES (1–12)

PSYCHOLOGY (PSYC)

Capital College

PSYC 300W CRITICAL THINKING AND WRITING IN PSYCHOLOGY (4) This course aims to teach psychology majors to think critically and to write clearly using APA writing style. Prerequisite: admission to psychology major and a grade of C or higher required in ENGL 202A
PSYC 301 HEALTH PSYCHOLOGY (3) Introduce students to application of psychological principles to health care that may promote wellness, foster illness, and affect treatment outcome. Prerequisite: PSY 002
PSYC 310 (GI) PSYCHOLOGY OF THE DIFFERENTLY ABLED (3) This course familiarizes students with the needs and abilities of people with varying physical challenges through academic and experimental exercises. Prerequisite: PSY 002

PSYC 350 STATISTICS AND RESEARCH DESIGN I (4) Introduction to statistical analysis and research design in psychology, including sampling, measurement, hypothesis development and testing, and interpretation of results. Prerequisite: psychology major and a grade of "C" or higher in a GQ math course (numbered MATH 021 or higher except MATH 035)
PSYC 351W STATISTICS AND RESEARCH DESIGN II (4) Applications of statistics and research design in psychology. A research project will be completed and a full APA report submitted. Prerequisite: grades of "C" or higher in PSYC 350
PSYC 395 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
PSYC 400 HEALTH PSYCHOLOGY (3) Introduce students to application of psychological principles to health care that may promote wellness, foster illness, and affect treatment outcome. Prerequisite: PSY 002
PSYC 402 EXPERIMENTAL SOCIAL PSYCHOLOGY (3) Introduces students to major theories and research methods in social psychology; includes attitudes, interpersonal attraction, and aggression. Prerequisite: PSY 002
PSYC 403 ADULT DEVELOPMENT (3) Comprehensive survey of theory and research concerning the physical, cognitive, emotional, behavioral and social aspects of adult development. Prerequisite: PSY 002
PSYC 405 CHILD DEVELOPMENT (3) Study of the psychology of the growing person from conception through adolescence, focusing more on periods up to middle childhood. Prerequisite: PSY 002
PSYC 406 ADOLESCENCE (3) Development of the adolescent in contemporary American society. Prerequisite: PSY 002 or SOC 001
PSYC 409 CHILD BEHAVIOR DISORDERS (3) Child behavior disorders covers the etiology, symptomatology, incidence, assessment, treatment, and prognosis of the major disorders of childhood and adolescence. Prerequisite: PSY 002
PSYC 410 (DF) PSYCHOLOGY OF THE DIFFERENTLY-ABLED (3) This course familiarizes students with the needs and abilities of people with varying physical challenges through academic and experimental exercises. Prerequisite: PSY 002
PSYC 412 HISTORY AND SYSTEMS OF PSYCHOLOGY (3) A consideration of the historical development of psychology with emphasis on the schools and theories developed by psychologists. Prerequisite: PSY 002
PSYC 415 ABNORMAL PSYCHOLOGY (3) An introduction to the study of abnormal behavior. Prerequisite: PSY 002
PSYC 421 BEHAVIOR MODIFICATION (3) Principles of advanced behavior modification techniques. Prerequisite: PSY 002
PSYC 424 PHYSIOLOGICAL PSYCHOLOGY (3) The physiological mechanism involved in sensory functions. Prerequisite: PSY 002
PSYC 425 COGNITION AND PERCEPTION (3) Issues in the scientific study of seeing and thinking, including recognition, attention, memory, imagery, reasoning, language, symbolization, consciousness. Prerequisite: PSY 002
PSYC 427 LEARNING THEORY (3) Applications of the principles of learning are presented. The prominent learning theories of psychology are viewed. Prerequisite: PSY 002
PSYC 444 TREATMENT AND EDUCATION IN DEVELOPMENTAL DISABILITIES (3) Covers etiology, classification, intervention (treatment and education), ethical and legal issues related to individuals with developmental disabilities. Prerequisite: PSY 002
PSYC 465 (WOMST) PSYCHOLOGY OF WOMEN (3) Explores topics pertaining to women including sex role stereotypes, gender differences, sex role socialization and developmental stages. Prerequisite: PSY 002
PSYC 482 PERSONALITY THEORY (3) Personality theories and constructs. Prerequisite: PSY 002
PSYC 490H HONORS THESIS (3) An opportunity to pursue an advanced research thesis or project to integrate studies within psychology. Prerequisite: HONOR 301H, senior standing, and permission of the program
PSYC 492 CURRENT TOPICS IN PSYCHOLOGY (3) Current topics addressing significant contemporary developments in psychology. Prerequisite: PSY 002
PSYC 494 RESEARCH PROJECT (1–12)
PSYC 496 INDEPENDENT STUDIES (1–18)
PSYC 497 SPECIAL TOPICS (1–9)

PSYCHOLOGY (PSYCH)

Penn State Erie, The Behrend College
PSYCH 097 SPECIAL TOPICS (1–9)
PSYCH 120 (GS;GI) CROSS-CULTURAL PSYCHOLOGY (3) This course examines how ethnic and cultural background influences patterns of human thought and behavior. Prerequisite: PSY 002
PSYCH 130 MANAGEMENT OF INTERPERSONAL RELATIONSHIPS (3) Conceptual framework for enhancing human relationships and applying problem- solving techniques within family, institution, and work situations. Prerequisite: PSY 002
PSYCH 197 SPECIAL TOPICS (1–9)
PSYCH 296 INDEPENDENT STUDIES (1–18)
PSYCH 397 SPECIAL TOPICS (1–9)
PSYCH 401 PROGRAM EVALUATION (3) Examination of the theories and practice of program evaluation; emphasis on applied work utilizing a wide range of evaluation approaches. Prerequisite: PSY 002 or SOC 001; PSY 015 or STAT 200; PSY 201

PSYCH 402 HUMAN SEXUALITY (3 credits per semester) Psychological influences on human sexual behavior such as love, sexual orientation, gender, intercourse, contraception, sexually transmitted diseases, dysfunctions, and paraphilias. Prerequisite: PSY 002, and 6 credits in PSY, PSYC, or PSYCH, and fifth-semester standing
PSYCH 411 PSYCHOLOGY OF DISCIPLINE (3) Provides theory and practice for effective discipline of children in a variety of situations. Prerequisite: PSY 002
PSYCH 427 ADVANCED SOCIAL PSYCHOLOGY (3) In depth study of selected research areas in human social behavior. Prerequisite: PSY 217
PSYCH 428 ADVANCED COGNITIVE PSYCHOLOGY (3) In depth study of complex mental processes: thinking, problem-solving, imagery, symbolic behavior, information-processing, attention, artificial intelligence, and language. Prerequisite: PSY 221
PSYCH 429 LEARNING AND MEMORY (3) General survey of learning and memory processes as revealed in experimental work with animals and humans. Prerequisite: PSY 221
PSYCH 431W ADVANCED RESEARCH METHODS IN PSYCHOLOGY (4) Advanced methodology focusing on the logic and practice of research culminating in the completion of a student designed research project. Prerequisite: PSY 201W
PSYCH 433 COGNITIVE DEVELOPMENT (3) Development of reasoning and related cognitive skills, such as perception and language. Prerequisite: PSY 213
PSYCH 434 SOCIAL AND PERSONALITY DEVELOPMENT (3) Development of social and personality attributes. Prerequisite: PSY 213
PSYCH 435 PSYCHOLOGY OF ADJUSTMENT AND SOCIAL RELATIONSHIPS (3) Theory and application of psychological principles to problems in personal and social adjustment. Prerequisite: PSY 002
PSYCH 440 HISTORY AND SYSTEMS OF PSYCHOLOGY (3) Historical antecedents to scientific psychology; development of contemporary psychological theories and research areas from the formal establishment of psychology. Prerequisite: 9 credits in PSY, PSYC, or PSYCH; 3 credit 400-level psycology course
PSYCH 442 SENSATION AND PERCEPTION (3) Fundamental processes and variables involved in the sensory and perceptual experiences of animals and humans. Prerequisite: PSY 203
PSYCH 446 ADOLESCENCE (3) Physical, cognitive, and personality development during adolescence. Prerequisite: PSY 213
PSYCH 454 CONDITIONING AND LEARNING (3) An examination of basic learning processes that have been determined within the context of classical, instrumental, and operant learning situations. Prerequisite: PSY 002
PSYCH 455 DEVELOPMENT THROUGHOUT ADULTHOOD (3) Physical, cognitive, and personality development during adulthood. Prerequisite: PSY 213
PSYCH 466 PSYCHOPHYSIOLOGY (3) Study of the biological bases of behavior and experience, including the anatomy and physiology of the brain and nervous system. Prerequisite: PSY 203
PSYCH 472 PSYCHOLOGY OF GENDER (3) Theories and research on biological, psychological, and social differentiation of females and males. Prerequisite: PSY 213 OR PSY 217
PSYCH 480 INTRODUCTION TO PERSONALITY (3) Personality theories and their application to social and personality development and personality dynamics. Prerequisite: 9 credits in PSY, PSYC, or PSYCH
PSYCH 486 ABNORMAL PSYCHOLOGY (3) Causes, dynamics, symptoms, and treatment of neuroses, psychoses, personality disorders, and other psychological disorders of adulthood. Prerequisite: 9 credits in PSY, PSYC, or PSYCH
PSYCH 487 INTRODUCTION TO CLINICAL PSYCHOLOGY (3) Diagnostic precedures, treatment approaches, occupational settings, and ethical considerations relevant to the profession of the clinical psychologist. Prerequisite: PSY 412 OR PSYCH 486
PSYCH 495 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
PSYCH 496 INDEPENDENT STUDIES (1–18)
PSYCH 497 SPECIAL TOPICS (1–9)

PUBLIC ADMINISTRATION (P ADM)

Capital College

P ADM 486 (H ADM) APPLIED STATISTICAL PACKAGES (1) Selection and application of computer packages for statistical analysis; construction and modification of files; design of program statements. Prerequisite: 3 credits statistics
P ADM 497 SPECIAL TOPICS (1–9)

PUBLIC POLICY (PUBPL)

Capital College

PUBPL 241 (CRIMJ) COMPUTER APPLICATIONS IN PUBLIC AFFAIRS/CRIMINAL JUSTICE (3) Introduction to computer applications for criminal justice and public affairs agencies.
PUBPL 304W PUBLIC POLICY ANALYSIS (3) The use of analytic models for describing and explaining the forces shaping policy and the consequence of policy decisions.

PUBPL 305 LEADERSHIP STUDIES (3) Exposure to a wide range of leadership issues that will bring students to a new understanding of leadership as responsibility. Prerequisite: fourth-semester standing
PUBPL 325 (AMSTD) AMERICAN POLITICAL CULTURE (3) Study of political culture in the United States. Prerequisite: 3 credits American Studies, Political Science, Public Policy, or Sociology
PUBPL 360 WORLD GEOGRAPHY (3) A geographic introduction to the major world regions and the dynamic interrelations that link regions together.
PUBPL 361 (DF) THEORIES AND ISSUES OF INTERNATIONAL POLITICS (3) Study of methods of analyzing international politics, with emphasis on contemporary issues.
PUBPL 397 SPECIAL TOPICS (1–9)
PUBPL 400 APPROACHES TO PUBLIC ADMINISTRATION (3) Decision making in governmental executive agencies emphasizing administrative theory, management processes, public interest, accountability, and interaction with legislatures and constituencies. Prerequisite: PUBPL 350
PUBPL 401 STATES' POLITICS AND POLICIES (3) Examines the social, political, economic, and demographic context, the governance processes of the American states, with emphasis on selected policies.
PUBPL 403 CONTEMPORARY UNITED STATES FOREIGN POLICY (3) A study of the principles and institutional processes of American foreign policy formulation, including national and international influences on current foreign policy.
PUBPL 408 AMERICAN CAMPAIGNS AND ELECTIONS (3) The new politics, its technology, and the strategic perspectives that underlie it. Prerequisite: PUBPL 350
PUBPL 409 THE POLITICS OF LEGISLATION (3) The process of decision making in the legislative and executive branches; analysis of formal, party, interpersonal, and interest group pressures. Prerequisite: PUBPL 350
PUBPL 410 (GI) (WOMST) WOMEN IN POLITICS IN THE U.S. (3) Course examines the U.S. women's movements, the participation of women in politics, and selected areas of public policy.
PUBPL 411 COMPARATIVE GOVERNMENT (3) Comparative analysis of representative contemporary Western and non-Western governmental institutions and political processes.
PUBPL 412 (GI) PROBLEMS OF DEVELOPING NATIONS (3) Interdisciplinary study of the political, economic, and social problems of developing nations.
PUBPL 413 (GI) RUSSIAN POLITICS AND POLICIES (3) Examination of Russian politics and policies, with attention directed toward the processes of democratization and marketization.
PUBPL 415 (CRIMJ) DRUG CONTROL POLICY IN COMPARATIVE PERSPECTIVE (3) Examines the history of drug control policy in the United States; comparisons and contrasts with other countries' experiences. Prerequisite: CRIMJ 200 or PL SC 001 or PL SC 014 or SOC 001
PUBPL 420 CONSTITUTIONAL LAW AND PUBLIC POLICY (3) Interdisciplinary analysis of Supreme Court as public policy-making institution, emphasizing judicial process and behavior, doctrines, precedents, and judicial impact.
PUBPL 421 CIVIL LIBERTIES AND THE ADMINISTRATION OF JUSTICE (3) Fundamental problems relating to civil liberties and the administration of justice.
PUBPL 426 METHODS IN SOCIAL RESEARCH (3) Basic course in methodology relevant to investigating social behavior in a natural setting.
PUBPL 436 ISSUES IN GEOPOLITICS (3) An examination of the geographical factors underlying and affecting the relationships between states.
PUBPL 437 (DF) GEOGRAPHY OF POVERTY (3) This course will examine the spatial variations in man's ability to modify and utilize the natural environment.
PUBPL 446 CONTEMPORARY ECONOMIC ISSUES (3) Application of the tools and analysis and models from economic analysis to new problems and problems designed by the students.
PUBPL 451 POLITICAL CAMPAIGN MANAGEMENT (3) Examination of the administrative management and operational aspects of the modern political campaign. Prerequisite: fifth-semester standing or by permission of the academic coordinator for the certificate program in practical politics
PUBPL 452 PUBLIC OPINION AND POLLING (3) An introduction to the interpretation, evaluation, and use of polling and public opinion research in practical politics. Prerequisite: fifth-semester standing or by permission of the academic coordinator for the certificate program in practical politics
PUBPL 464 POLITICAL THEORY (3) Selected political thought of early historical periods and the identification of problems of continuing significance.
PUBPL 470 THE PRESIDENCY AND THE EXECUTIVE PROCESS (3) The development of the Presidency and the impact of executive leadership on parties, policy, public opinion, and the bureaucracy. Prerequisite: PUBPL 350
PUBPL 480 SEMINAR IN URBAN POLICY (3) Work in this course will focus upon governmental institutions and public policy problems in metropolitan areas. Prerequisite: seventh-semester standing
PUBPL 481 SEMINAR IN ENVIRONMENTAL POLICY (3) Fundamentals of evolution; impacts on natural resources; interaction of environmental issues, current decision-making process policy, enforcement mechanisms; future actions. Prerequisite: seventh-semester standing
PUBPL 482 SEMINAR IN HEALTH POLICY (3) Introduction to policy analysis of issues of current interest and importance to public administrators in the health industry. Prerequisite: seventh-semester standing
PUBPL 483 SEMINAR IN NATIONAL SECURITY POLICY (3) Course will examine the inter-relationship of foreign, military and economic policy. Prerequisite: seventh-semester standing

PUBPL 484 SEMINAR IN TRANSPORTATION POLICY (3) Transportation policy; a consideration of its formulation and application in the Federal system. Prerequisite: seventh-semester standing
PUBPL 485 SEMINAR IN WELFARE POLICY (3) Course examines the origins, development, and impact of welfare programs. Prerequisite: seventh-semester standing
PUBPL 490 SEMINAR IN PUBLIC POLICY (3 per semester) A survey of the major policy issues, actors and institutions involved in the policy-making system of contemporary society. (May be repeated for credit.) Prerequisite: seventh-semester standing
PUBPL 495 INTERNSHIP (3–12) Experience in a public service agency related to knowledge gained through academic course work, reading, and discussion. Prerequisite: seventh-semester standing
PUBPL 496 INDEPENDENT STUDIES (1–18)
PUBPL 497 SPECIAL TOPICS (1–9)

QUALITY CONTROL (Q C)

Penn State Erie, The Behrend College
Q C 097, 098; 197, 198; 297; 397, 497 SPECIAL TOPICS (1–9)
Q C 200 QUALITY CONTROL FOR PLASTICS PROCESSING (2) Fundamental techniques of statistical process control, quality improvement, and problem solving related to plastics processing. Intended for Plastics Engineering Technology students. Prerequisite or concurrent: PL ET 270
Q C 450 QUALITY CONTROL AND QUALITY IMPROVEMENT (3) Review of quality control and improvement methods including SPC applications, acceptance sampling, regression analysis, and design of experiments. Prerequisite: MATH 141 or MTHBD 210

QUALITY AND MANUFACTURING MANAGEMENT (Q M M)

Interdisciplinary
Q M M 491 INTRODUCTION TO BUSINESS CONCEPTS FOR MANUFACTURING (3) Introduction to business, topics in marketing, accounting, and finance for nonbusiness students in manufacturing management. Prerequisite: students taking this course CANNOT be Business majors and must be in their senior year
QMM 492 INTRODUCTION TO ENGINEERING DESIGN PRINCIPLES (3) Engineering principles including different engineering fields, graphics, design, solid modeling and failure analysis. Prerequisite: students taking this course CANNOT be Engineering majors and must be in their senior year

QUANTIFICATION (QUANT)

Capital College
QUANT 310 MATHEMATICAL METHODS IN THE SOCIAL AND MANAGERIAL SCIENCES (3) Functions (linear and nonlinear), systems of linear equations, matrix algebra, introductory differential calculus, applications in business and economics. Prerequisite: college algebra

RADIOLOGICAL SCIENCES (RADSC)

Commonwealth College
RADSC 101 RADIOGRAPHIC INTRODUCTION AND PROCEDURES/LAB I (4) Radiology history, basic radiation protection principles, medical terminology, introduction to radiography and radiographic procedures/lab.
RADSC 102 RADIOGRAPHIC PROCEDURES/LAB II (4) Continuation of Radiographic Procedures/Lab I to include appendicular skeleton and introduction to head work. Prerequisite: RADSC 101, RADSC 110
RADSC 103 RADIOGRAPHIC PROCEDURES/LAB III (3) Continuation of Radiographic Procedures/Lab II to include digestive, urinary, and biliary systems and facial bone work. Prerequisite: RADSC 102
RADSC 110 PATIENT CARE IN RADIOLOGIC SCIENCES (3) Basic concepts of routine and emergency patient care procedures addressed from the radiographer's perspective.
RADSC 204 RADIOGRAPHIC EXPOSURE I (3) Fundamental knowledge base of factors that govern and influence the production and recording of radiologic images. Prerequisite: RADSC 103
RADSC 205 RADIOGRAPHIC EXPOSURE II (3) Continuation of exposure factors concerning radiographic imaging; film, electronic imaging, processing, quality assurance and related areas will be emphasized. Prerequisite: RADSC 204
RADSC 206 ADVANCED RADIOGRAPHIC PROCEDURES (3) Emphasis on specialized positioning and advanced radiographic procedures; includes introduction to cross-sectional anatomy. Prerequisite: BIOL 141, RADSC 205
RADSC 207 REGISTRY REVIEW (4) Registry Review includes material from all radiological science courses, with emphasis on National Certification Examination, and career planning. Prerequisite: RADSC 206
RADSC 210W RADIOGRAPHIC PATHOLOGY (3) Writing intensive study of theories of disease causation and the pathophysio- logic disorders compromising health systems with emphasis on radiographic presentation. Prerequisite: BIOL 129, BIOL 141
RADSC 220 RADIATION BIOLOGY AND PROTECTION (3) Study the principles of interaction of radiation with living systems, effects on cells and tissues, biological response, and radiation protection.
RADSC 230 RADIOGRAPHIC PHYSICS (3) Basic knowledge of atomic structure, characteristics of radiation, x-ray production, photon interactions, circuitry, imaging equipment and quality control.

RADSC 240 PHARMACOLOGY AND DRUG ADMINISTRATION (2) Basic concepts of pharmacology, the basic techniques of venipuncture, and the administration of diagnostic contrast agents and/or intravenous medications. Prerequisite: BIOL 141, RADSC 110
RADSC 295 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor

REAL ESTATE (R EST)

Smeal College of Business
R EST 100 REAL ESTATE PRACTICE (3) Study of real estate to enable individuals to make successful transactions and decisions. May not be used to satisfy Smeal College baccalaureate degree requirements. Prerequisite: not available to students who have taken R EST 301
R EST 296 INDEPENDENT STUDIES (1–18)
R EST 297 SPECIAL TOPICS (1–9)
R EST 301 REAL ESTATE FUNDAMENTALS (3) Introduction to urban real estate; economic forces affecting property rights; real estate markets and finance; land-use analysis; government policies.
R EST 306 THE VALUATION OF REAL PROPERTY (3) Principles governing legal and economic determinations of land values; theory of appraising; studies of economic effects on property values. Prerequisite: B A 301 OR R EST 301
R EST 325 (B LAW) REAL ESTATE LAW (3) Analysis of contemporary law applicable to various types of ownership interests and rights, methods of transferring ownership, and use of real property. Prerequisite: B A 243 or B LAW 243 or R EST 301
R EST 395 INTERNSHIP IN REAL ESTATE (1–18)
R EST 409 (FIN) REAL ESTATE FINANCE AND INVESTMENT (3) The sources and uses of credit; instruments and methods of financing; the theory and practice of real estate investment analysis. Prerequisite: FIN 305W or R EST 301
R EST 425 (B LAW) ENVIRONMENTAL LAW, PROPERTY, AND COMMERCE (3) Examines the impacts of major federal environmental laws on business relations and property interests. Prerequisite: B A 243, B LAW 243, OR E R M 151
R EST 440 ADVANCED TECHNIQUES IN REAL ESTATE ANALYSIS (3) Theories and methods of modern financial analysis including specialized computer applications, valuation of mortgage securities, portfolio applications, and option pricing. Prerequisite: R EST 305 OR R EST 410
R EST 450W URBAN PROPERTY RIGHTS AND LAND USE ISSUES (3) Analysis of real estate as property; historical assessments of property issues; evaluation of land use regulations. Prerequisite: R EST 306 or R EST 409
R EST 494. RESEARCH PROJECT (1–12)
R EST 496 INDEPENDENT STUDIES (1–18)
R EST 497 SPECIAL TOPICS (1–9)
R EST 499 (GI) FOREIGN STUDIES (1–12)

RECREATION AND PARK MANAGEMENT (R P M)

College of Health and Human Development
R P M 101INTRODUCTION TO RECREATION SERVICES (2) Introduction to discipline and exploration of professional career models/ paths, historical development of profession, expectations and opportunities in recreation services.
R P M 120 LEISURE AND HUMAN BEHAVIOR (3) Leisure from historical and contemporary perspectives, including forces shaping leisure behavior, and relationships among leisure, the environment, and social institutions.
R P M 210 INTRODUCTION TO COMMERCIAL RECREATION AND TOURISM (2) Historical and contemporary perspectives of the field of commercial recreation and tourism.
R P M 236 SUPERVISION AND GROUP DYNAMICS IN RECREATION SERVICES (3) Supervision in recreation services, including theories, strategies, group dynamics, applied leadership and decision-making skills.
R P M 277 (GI) RECREATION FOR PERSONS WITH DISABILITIES (3) Encouragement of appreciation for cultural experiences, disability-related characteristics, and recreation pursuits among persons with disabilities.
R P M 295A INTRODUCTION TO GOLF MANAGEMENT (1) Introduction to various phases of golf operations in public, private, municipal, or military settings. Prerequisite: 2.00 cumulative grade point average
R P M 296 INDEPENDENT STUDIES (1–18)
R P M 297 SPECIAL TOPICS (1–9)
R P M 300W TOURISM AND LEISURE BEHAVIOR (3) Examination of the impact of recreational sociocultural, governmental, economic, and physical environment on the leisure traveler within the tourism industry.
R P M 320 RECREATION RESOURCE PLANNING AND MANAGEMENT (3) Relationship between leisure behavior and natural environment. Exploration of natural resources which enhance leisure.
R P M 325 PRINCIPLES OF ENVIRONMENTAL INTERPRETATION (3) Introduction, history, practice, and principles of contemporary interpretive activities common to natural and cultural history program sites.

R P M 326 NATURAL HISTORY INTERPRETATION (3) Methods, techniques, resources to acquire knowledge of natural history. Field identification, projects of an applied nature, and seasonal application. Prerequisite: R P M 325

R P M 327 CULTURAL HISTORY INTERPRETATION (3) Methods, skills, and techniques necessary for the programming of historical sites and areas. Prerequisite: R P M 325

R P M 330 OUTDOOR PURSUITS: ADVENTURE-BASED PROGRAM LEADERSHIP (3) Both theoretical and experiential components are included as the role of the leader in outdoor adventure programs is examined.

R P M 334 NON-PROFIT RECREATION AGENCY OPERATIONS (3) Recreation agencies in voluntary and semiprivate sectors will be investigated through membership strategies, fund raising, volunteer management, etc. case studies. Prerequisite: or concurrent: R P M 356

R P M 356 PROGRAMMING IN RECREATION SERVICES (3) Translating agency philosophy and policy into understanding of organization, management, implementation, and evaluation of programming in recreation services. Prerequisite: or concurrent: R P M 101, R P M 236; fifth-semester standing

R P M 360 GOLF OPERATIONS MANAGEMENT (3) The course will focus on business planning, budgeting, inventory management, and financial controls within golf operations. Prerequisite: B A 250

R P M 386 THERAPEUTIC RECREATION SERVICE DELIVERY (3) Skills and knowledge to deliver therapeutic recreation services based upon a sound philosophy. Prerequisite: or concurrent: R P M 277

R P M 394 ORIENTATION TO PRACTICUM (1) Plan and prepare for practicum in leisure studies. Analyze career placement opportunities, practicum process, and associated requirements. For R P M majors only. Prerequisite: fifth-semester standing

R P M 395B PARTICIPATION IN GOLF MANAGEMENT (2) Practical individual involvement in selected golf operations in public, private, municipal, or military settings. Prerequisite: R P M 295A; 2.00 cumulative grade point average

R P M 397 SPECIAL TOPICS (1–9)

R P M 410 MARKETING OF RECREATION SERVICES (3) Theoretical/practical application of marketing/advertising strategies in the development/delivery of recreation services. Prerequisite: fifth-semester standing or above

R P M 415 COMMERCIAL RECREATION MANAGEMENT (3) Planning, developing, and managing profit-oriented recreation opportunities. Prerequisite: R P M 410

R P M 420 OUTDOOR RECREATION BEHAVIOR (3) Overview of participation patterns in outdoor recreatino activities; factors affecting outdoor recreation participation; identification of implications for planning and management. Prerequisite: R P M 120

R P M 425 PRINCIPLES OF INTERPRETIVE MATERIALS (3) Principles, practices, application of non-personal interpretive activities common to natural/cultural history, including exhibits, audio-visual and illustrative materials. Prerequisite: R P M 325

R P M 430 (AEE) ENVIRONMENTAL EDUCATION METHODS AND MATERIALS (3) Methods and materials for developing, implementing, and evaluating environmental education programs within formal and non-formal educational settings. Prerequisite: R P M 325 or AEE 100

R P M 433W RESEARCH AND EVALUATION IN RECREATION AND PARKS (3) Systematic, structured problem-solving process for decision making in recreation and parks. Research techniques/evaluation procedures; quantitative, qualitative methodologies; deductive, inductive reasoning. Prerequisite: R P M 356, 3 credits in statistics

R P M 434 RECREATIONAL FACILITY DEVELOPMENT (3) Park planning as a role of recreation professionals, emphasizing physical support provisions and elimination of architectural barriers; evaluation. Prerequisite: R P M 365

R P M 435 RECREATION FACILITY PLANNING (3) Planning of selected recreational facilities with emphasis upon activity and support provisions. Prerequisite: fifth-semester standing or above

R P M 440 OUTDOOR EXPERIENTIAL PROGRAMMING AND ADMINISTRATION (3) Utilization of wilderness/backcountry environments and participant challenge; history, models, theories; survey of organizations; program design, administration; and issues. Prerequisite: or concurrent: R P M 330 or R P M 356

R P M 460 POLITICAL AND LEGAL ASPECTS OF RECREATION SERVICES (3) Role of local, state, federal government in provision of recreation services. Legislative and judicial systems. Prerequisite: R P M 101

R P M 470 RECREATION AND PARK MANAGEMENT (3) Management procedures for indoor/outdoor recreation facilities; maintenance, risk management, vandalism control, capital development, fiscal management, computer applications. Prerequisite: R P M 320

R P M 476 LEISURE EDUCATION IN THERAPEUTIC RECREATION (3) Theoretical and practical application of leisure education in the therapeutic recreation process. Prerequisite: R P M 277, R P M 386

R P M 480 SENIOR MANAGEMENT SEMINAR (1) Current management issues will be examined relative to professional management strategies, ethics, and leadership in leisure services. Prerequisite: sixth-semester standing in R P M

R P M 486 FACILITATION TECHNIQUES IN THERAPEUTIC RECREATION (3) Intervention strategies, therapeutic approaches, and group facilitation techniques in therapeutic recreation. Prerequisite: R P M 386

R P M 495A PRACTICUM IN RECREATION AND PARKS (12) Meet educational objectives through participation in organized practical experience; direct observation and professional supervision in full-time work experience. Prerequisite: R P M 394, seventh-semester standing, 300 hours practical experience, and a 2.0 grade-point average, current and valid certification in advanced first aid and cardiopulmonary resuscitation

R P M 495B INTERNSHIP IN GOLF MANAGEMENT (3) Observation and participation under supervision in golf operations in public, private, municipal, or military settings. Prerequisite: R P M 395B; 2.00 cumulative grade point average, current and valid certification in advanced first aid and cardiopulmonary resuscitation
R P M 495C INTERNSHIP IN GOLF MANAGEMENT (4) Observation and participation under supervision in golf operations in public, private, municipal, or military settings. Prerequisite: R P M 495B; 2.00 cumulative grade point average
R P M 495D INTERNSHIP IN GOLF MANAGEMENT (4) Observation and participation under supervision in golf operations in public, private, municipal, or military settings. Prerequisite: R P M 495C; 2.00 cumulative grade point average
R P M 496 INDEPENDENT STUDIES (1–18)
R P M 497 SPECIAL TOPICS (1–9)

REHABILITATION (REHAB)

College of Education

REHAB 408 INTRODUCTION TO VOCATIONAL REHABILITATION (3) Disability, public and private rehabilitation agencies, case study and handling; resources for training; observations in rehabilitation settings. Prerequisite: 6 credits in psychology and/or sociology
REHAB 409 MEDICAL ASPECTS OF DISABILITY (3) Common disabling illnesses, injuries, and congenital defects; their symptomatology, prognosis, and treatment; implications for personal, social, and vocational adjustment. Prerequisite: 6 credits in psychology and/or sociology
REHAB 410 PSYCHIATRIC REHABILITATION (3) A survey of principles and practices, programs, personnel and facilities, community organization, public and private efforts, and trends and needs in the field of psychiatric rehabilitation. Prerequisite: 6 credits in psychology and/or sociology
REHAB 412 PROFESSIONAL PREPARATION IN REHABILITATION SETTINGS (3) Practices related to evaluation and integration of facilities and services appropriate to vocational rehabilitation; internship selection and professional preparation. Prerequisite: or concurrent: CN ED 408
REHAB 413W REHABILITATION CASE RECORDING AND MANAGEMENT (3) Principles and practices of obtaining, recording, evaluating, and utilizing case data in vocational rehabilitation planning; implementation of rehabilitation plans. Prerequisite: CN ED 408. Prerequisite or concurrent: CN ED 412
REHAB 425 ASSESSMENTS AND TESTS IN REHABILITATION PRACTICE (3) Overview of the nature and use of tests in rehabilitation, with particular focus on vocational rehabilitation and independent living. Prerequisite: or concurrent: 3 credits in statistics
REHAB 495A FIELD WORK IN VOCATIONAL REHABILITATION (15) Full-time practicum in agencies and institutions providing educational- vocational and related services essential to employability and/or employment. Prerequisite: students must have completed all other required coursework before they can begin their internship; a grade of C or higher in all specified and professional courses
REHAB 496 INDEPENDENT STUDIES (1–18)

RELIGIOUS STUDIES (RL ST)

College of the Liberal Arts

RL ST 001 (GH;DF) INTRODUCTION TO WORLD RELIGIONS (3) An historical and comparative survey of the principal beliefs and practices of the world's major religions.
RL ST 003 (GH;GI) INTRODUCTION TO THE RELIGIONS OF THE EAST (3) Religious experience, thought, patterns of worship, morals, and institutions in relation to culture in Eastern religions.
RL ST 004 (GH;GI) (CAMS;J ST) JEWISH AND CHRISTIAN FOUNDATIONS (3) Introduction to the perspectives, patterns of worship, morality, historical roots, and institutions of the Judaeo-Christian traditions; their relationships to culture.
RL ST 007 INNER LIVES IN RELIGIOUS BIOGRAPHY (3) Reading and discussion of selected autobiographical and biographical statements to discover and compare different forms of spirituality.
RL ST 012 (GH;GI) (CAMS;J ST) LANDS OF THE BIBLE (3) Textual and archaeological evidence for the lands, cities, and peoples associated with the Hebrew Bible and Christian scriptures.
RL ST 044 (GH;GI) (CAMS) ANCIENT NEAR EASTERN AND EGYPTIAN MYTHOLOGY (3) Survey of major ancient Mediterranean myths, gods, and goddesses in their cultural contexts; influence on later cultures.
RL ST 083S (GH) FIRST-YEAR SEMINAR IN RELIGIOUS STUDIES (3) Critical approaches to the dimensions and directions in Religious Studies.
RL ST 101 (GH) COMPARATIVE RELIGION (3) Comparative or historical analysis of religious factors—worship, theology, ethics, scriptures, etc., in two or more religious traditions.
RL ST 102 (GH;GI) (CAMS;HIST;J ST) CANAAN AND ISRAEL IN ANTIQUITY (3) Political, social, and intellectual history of the land of Canaan/Israel in the Biblical era: Late Bronze and Iron Ages.
RL ST 103 (GH;GI) INTRODUCTION TO HINDUISM (3) Historical development of Hinduism to the present.
RL ST 104 (GH;GI) INTRODUCTION TO BUDDHISM (3) A general survey of the basic doctrine, practice, and historical development of Hinayana and Mahayana Buddhism.
RL ST 105 (GH;GI) BUDDHISM IN THE WESTERN WORLD (3) A general survey of the development of Buddhism as a religious tradition in the West, focusing especially on America.
RL ST 106 (GH) MYSTICISM (3) A survey of the history, philosophy, and cultural impact of various mystical traditions in relation to world religions.

RL ST 107 (GH) INTRODUCTION TO ISLAM (3) Community and message of the early movement; development of authoritative structures and traditions; proliferation of sects; theology and creeds; mysticism.
RL ST 110 (GH;GI) (CAMS;J ST) HEBREW BIBLE: OLD TESTAMENT (3) Introduction to the history, literature, and religion of ancient Israel.
RL ST 111 (GH;GI) (CAMS;J ST) EARLY JUDAISM (3) Religious thought, practices, and parties in the Second Temple period; the emergence of rabbinic Judaism.
RL ST 114 (GH;GI) (J ST) MODERN JUDAISM (3) Trends in Jewish life and thought since the French revolution; Judaism's responses to the challenge of modernity.
RL ST 120 (GH) (CAMS;J ST) NEW TESTAMENT (3) Introduction to the history, literature, and religion of early Christianity in its Jewish-Hellenistic setting.
RL ST 121 JESUS OF NAZARETH (3) An historical critical examination of the life and message of Jesus of Nazareth.
RL ST 122 PAUL THE APOSTLE (3) An introduction to, and analysis of, the writings and thought of the apostle Paul in the context of early christianity.
RL ST 124 (GH;GI) (CAMS;J ST) EARLY AND MEDIEVAL CHRISTIANITY (3) Analysis in cultural context of selected thinkers, ideas, and movements in Christianity from the second through the fifteenth century.
RL ST 125W (GH) MODERN CHRISTIANITY (3) Analysis in cultural context of selected thinkers, ideas, and movements in Christianity from the sixteenth century to the present.
RL ST 130 (GH) THE ETHICS OF WESTERN RELIGION (3) History of theological-social ethics of the Judaeo-Christian tradition.
RL ST 131 (GH) (PHIL) INTRODUCTION TO BIOETHICS (3) Studies questions of ethics in relation to biotechnology research and implementation, genetic engineering, medicine, animal and human rights.
RL ST 132W SECTS AND CULTS (3) The origins, beliefs, and practices of new or dissenting religious groups and their relationship to the dominant religious culture.
RL ST 133 (GH) (CAMS;J ST) ARCHAEOLOGY OF THE LEVANT AND ANCIENT ISRAEL (3) Archaeology of the Levant and Ancient Israel to c. 1000 B.C.E.; relationship between archaeological and textual evidence.
RL ST 134 (GH;GI) (CAMS;J ST) ARCHAEOLOGY OF BIBLICAL ISRAEL (3) Archaeology of Biblical Israel from 1200 B.C.E. to c. 640 C.E.; relationship between archaeological and textual evidence.
RL ST 137 (GH) (WMNST) WOMEN AND RELIGION (3) Jewish and Christian religious views on womanhood; thought and lives of important religious women; and feminist understandings of these. Prerequisite: third-semester standing
RL ST 140W (GH;GI) (AM ST) RELIGION IN AMERICAN LIFE AND THOUGHT (3) The function, contributions, tensions, and perspectives of religion in American culture.
RL ST 145 (GH;GI) (AAA S) AFRICAN AMERICAN RELIGION (3) History and significance of the religious dimension of the Black American struggle for equality from enslavement to the contemporary period.
RL ST 146 (GH;GI) (AAA S) THE LIFE AND THOUGHT OF MARTIN LUTHER KING, JR. (3) A survey of the civil rights leader including his religious beliefs, intellectual development, and philosophy for social change.
RL ST 147 (GH;GI) (AAA S) THE LIFE AND THOUGHT OF MALCOLM X (3) The life of Malcolm X/El Hajj Malik El Shabazz (1925-1965) and his social, political, economic, and moral thought.
RL ST 165 (ARAB;HIST) INTRODUCTION TO ISLAMIC CIVILIZATION (3) Islamic history, culture, religious life c.600-1500 C.E.
RL ST 170 (J ST) DEATH AND AFTERLIFE IN THE BIBLICAL ERA (3) Changing concepts of death and the afterlife in the Jewish and Christian traditions c. 1500 B.C.E.-300 C.E.
RL ST 181 INTRODUCTION TO THE RELIGIONS OF CHINA AND JAPAN (3) A survey of the history, philosophy, and cultural impact of the major Far Eastern religions: Confucianism, Taoism, Buddhism, and Shinto.
RL ST 187 RELIGIOUS STUDIES FRESHMAN SEMINAR (3) The meaning and advantages of a Liberal Arts education in context of a specific discipline. Prerequisite: first-semester standing and enrollment in the College of the Liberal Arts
RL ST 197 SPECIAL TOPICS (1–9)
RL ST 235 (HIST;J ST) THE CHURCH AND THE JEWS (3) Examination of the relationship between Western church and the Jews from the First Century to Enlightenment.
RL ST 236 (GS) (PSY) INTRODUCTION TO PSYCHOLOGIES OF RELIGION (3) Introduction to major Western psychologies of religion (James, Freud, Jung) and to subsequent extensions of and departures from them.
RL ST 237 (GS) (PSY) INTRODUCTION TO RELIGIONS, CULTURES, AND THERAPIES (3) Comparison of methods and goals of selected religious and secular therapies within their cultural contexts. Prerequisite: PSY 002
RL ST 294 RESEARCH PROJECT (1–12)
RL ST 297 SPECIAL TOPICS (1–9)
RL ST 395 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
RL ST 400 THEORIES OF RELIGION (3) Comparative and interdisciplinary study of two or more systematic theories of religion: anthropological, psychological, sociological, philosophical/theological. Prerequisite: 6 credits in religious studies or seventh-semester standing

RL ST 401 STUDIES IN COMPARATIVE RELIGION (3) An intensive study of comparable phenomena from two or more religious traditions. Prerequisite: 6 credits in religious studies
RL ST 402 CONTEMPORARY RELIGIOUS THOUGHT (3) Writings of outstanding contemporary religious thinkers in the Jewish, Protestant, and Roman Catholic traditions and their impact on our culture. Prerequisite: 6 credits in humanities
RL ST 407W (GI) (HIST;J ST) EUROPEAN ANTI-SEMITISM FROM ANTIQUITY TO THE PRESENT (3) Surveys the history of anti-Semitism in Europe from antiquity through the Middle Ages to the present.
RL ST 408 (GI) HINDU STUDIES (3) Special topics in Hindu studies. Prerequisite: 3 credits in religious studies
RL ST 409 BUDDHIST STUDIES (3) Special topics in Buddhist studies. Prerequisite: 3 credits in religious studies
RL ST 410 (HIST;J ST) JEWS IN THE MEDIEVAL WORLD (3) Trends in medieval Jewish society under Islam and Western Christendom.
RL ST 411 (J ST) JEWISH STUDIES (3) Study of the life and thought of a particular period or movement in the history of Judaism. Prerequisite: 3 credits in religious studies
RL ST 412 (J ST) AMERICAN JUDAISM (3) The development of Jewish religion and culture in America from the colonial era to the present. Prerequisite: HEBR 010 or J ST 010
RL ST 414 (PSY) HUMANISTIC, EXISTENTIAL, AND RELIGIOUS APPROACHES TO PSYCHOLOGY (3) Existential, humanistic, and religious approaches to the psychology of experience, consciousness, and will. Prerequisite: PSY 002 OR RL ST 001
RL ST 420 MAJOR CHRISTIAN THINKERS (3) Systematic inquiry into the religious thought of one or more Christian thinkers, such as Paul, Augustine, Luther, Calvin, Kierkegaard, or Tillich. Prerequisite: 3 credits in religious studies
RL ST 422 (AM ST) RELIGION AND AMERICAN CULTURE (3 per semester, maximum of 6) Selected topics, problems, or historical movements in American religion. Relation between religion and American culture.
RL ST 424H (HIST;J ST;PHIL) MONOTHEISM AND THE BIRTH OF THE WEST (3) The birth of monotheism and its relation to social organization, the idea of individuality, and science. Prerequisite: RL ST 004, RL ST 102, RL ST 110, or RL ST 120
RL ST 440W (RUS) THE ORTHODOX CHRISTIAN TRADITION (3) History, culture, and beliefs of the Eastern Orthodox religious tradition with special reference to Russia. Prerequisite: RL ST 004, RL ST 124, RL ST 125, RUS 100 OR RUS 110
RL ST 461 (SOC) SOCIOLOGY OF RELIGION (3) Contemporary religion in the United States: beliefs, structure, and function of major denominations and religious cults. Prerequisite: 3 credits of sociology or religious studies
RL ST 471W (HIST) CLASSICAL ISLAMIC CIVILIZATION, 600-1258 (3) Pre-Islamic Arabia; Muhammad; Arab conquest; Islamic beliefs and institutions; literary, artistic, and scientific achievements; relations with Europe; breakdown of unity.
RL ST 479 (PSY) RELIGION AND CULTURE IN FREUDIAN THOUGHT (3) Readings, lectures, and discussion on major psychoanalytic claims about individual and cultural mental life, focusing on the theory of religion. Prerequisite: PSY 002
RL ST 481 RELIGION AND JAPANESE CULTURE (3) A study of the impact of the traditional religions, Shinto and Buddhism, on the intellectual and cultural history of Japan. Prerequisite: 3 credits from HIST 172, HIST 173, HIST 174, HIST 175, PHIL 111, RL ST 003, RL ST 104, or RL ST 181
RL ST 483 ZEN BUDDHISM (3) The development and current state of Zen Buddhist thought and practice. Prerequisite: HIST 172, HIST 173, HIST 174, HIST 175, PHIL 111, RL ST 003, RL ST 104, or RL ST 181
RL ST 494 RESEARCH PROJECT (1–12)
RL ST 496 INDEPENDENT STUDIES (1–18)
RL ST 497 SPECIAL TOPICS (1–9)
RL ST 499 (GI) FOREIGN STUDY—RELIGIOUS STUDIES (1–12) Courses offered in foreign countries by individual or group instruction.

RESERVE OFFICERS' TRAINING CORPS (ROTC)

See individual listings under AIR FORCE, ARMY, and NAVAL SCIENCE

ROMANIAN (ROM)

College of the Liberal Arts
ROM 296 INDEPENDENT STUDIES (1–18)
ROM 297 SPECIAL TOPICS (1–9)

RURAL SOCIOLOGY (R SOC)

College of the Liberal Arts
*R SOC 011 (GS) INTRODUCTORY RURAL SOCIOLOGY (3) Basic sociological concepts applied to rural societal institutions and rural communities; causes and consequences of rural social change.

R SOC 296 INDEPENDENT STUDIES (1–18)
R SOC 297 SPECIAL TOPICS (1–9)
R SOC 305W LEADERSHIP FOR SOCIAL CHANGE (3) Exploration, analysis, understanding, and application of leadership skills and concepts in groups, organizations, and communities. Prerequisite: 6 credits in social or behavioral sciences
R SOC 327 (S T S) SOCIETY AND NATURAL RESOURCES (3) Analysis of the relationships between societal development and enhancement and natural resources.
R SOC 356 RURAL COMMUNITY SERVICES (3) Analysis of provider and consumer factors influencing the provision of community services in rural areas; sociological analysis and interpretation emphasized. Prerequisite: R SOC 011 or 3 credits in related social science
R SOC 402 CONSUMER BEHAVIOR AND AGRICULTURAL BUSINESS (3) The principles of consumer behavior applied to the marketing of agricultural products and farm supplies. Prerequisite: 3 credits in agricultural economics or economics, and 3 credits in rural sociology, sociology, or psychology
R SOC 417 (CEDEV) POWER, CONFLICT, AND COMMUNITY DECISION MAKING (3) Theory and analysis of power, conflict and decision making, and community crisis. Community change illustrations will be used. Prerequisite: 6 credits in social or behavioral science
R SOC 420 (GI) (CEDEV;WMNST) WOMEN IN DEVELOPING COUNTRIES (3) Analysis of women's work, experiences, and development policies and practices in Africa, Asia, and Latin America.
R SOC 422 FAMILY IN RURAL SOCIETY (3) The relationship between the family and rural society, including critical review of theories, research and problems, issues, and trends. Prerequisite: 6 credits in the social sciences
R SOC 425 POVERTY ANALYSIS: PEOPLE AND PROGRAMS (3) Social and economic situations contributing to deprivation in rural society; intervention programs and policy development. Prerequisite: 6 credits in sociology, economics, or related areas
R SOC 444 SOCIAL CHANGE IN RURAL AMERICA (3) Analysis of causes of social change and its consequences for individuals, families, and organizations in rural communities. Prerequisite: R SOC 011 or 3 credits in related social science
R SOC 452 (CEDEV) RURAL ORGANIZATION (3) Social organization and change in rural communities; use of sociological principles in analysis of rural problems and rural development. Prerequisite: 6 credits in rural sociology, sociology, or psychology
R SOC 460 (CEDEV) INTRODUCTION TO COMMUNITY INFORMATION SYSTEMS (3) Introduction to community information systems; information needs; common features; issues in development; organization vs. community-wide systems; current technologies. Prerequisite: 6 credits in quantification; 6 credits in social or behavioral science
R SOC 462 (CEDEV) COMMUNITY INFORMATION SYSTEMS LABORATORY (3) Laboratory for the development of a model community information system. Prerequisite: R SOC 460
R SOC 470 (CEDEV) COMPARATIVE COMMUNITY DEVELOPMENT (3) Crosscultural community development projects and the problems encountered in each of the different cultural contexts. Prerequisite: 6 credits in social or behavioral science
R SOC 496 INDEPENDENT STUDIES (1–18)
R SOC 497 SPECIAL TOPICS (1–9)
R SOC 499 (GI) FOREIGN STUDY—RURAL SOCIOLOGY (1–12) Study in selected countries of rural social institutions and current rural sociological problems.
*Students may take only one course for General Education credit from R SOC 011 GS or SOC 001 GS.

RUSSIAN (RUS)

College of the Liberal Arts

RUS 001 ELEMENTARY RUSSIAN I (4) Audio-lingual approach to basic Russian; writing. Students who have received high school credit for two or more years of Russian may not schedule this course for credit, without the permission of the department.
RUS 001G TECHNICAL RUSSIAN FOR GRADUATE STUDENTS (3) Prepares student to translate technical and scientific texts. No previous knowledge of Russian is required.* *No graduate credit is given for this course.
RUS 001L ELEMENTARY RUSSIAN I (4) Audio-lingual approach to basic Russian; writing. Students who have received high school credit for two or more years of Russian may not schedule this course for credit, without the permission of the department.
RUS 001P ELEMENTARY RUSSIAN I Audio-lingual approach to basic Russian; writing. Students who have received high school credit for two or more years of Russian may not schedule this course for credit, without the permission of the department.
RUS 002 ELEMENTARY RUSSIAN II (4) Audio-lingual approach to basic Russian continued; writing. Students who have received high school credit for four years of Russian may not schedule this course for credit, without the permission of the department. Prerequisite: RUS 001
RUS 002G RUSSIAN TEXTS (3) Development of skill in translating Russian texts in the sciences and social sciences. (No graduate credit is given for this course. Prerequisite: RUS 005 or RUS 001G)
RUS 002L ELEMENTARY RUSSIAN II (4) Audio-lingual approach to basic Russian continued; writing. Students who have received high school credit for four years of Russian may not schedule this course for credit, without the permission of the department. Prerequisite: RUS 001

RUS 002P ELEMENTARY RUSSIAN II Audio-lingual approach to basic Russian continued; writing. Students who have received high school credit for four years of Russian may not schedule this course for credit, without the permission of the department. Prerequisite: RUS 001
RUS 003 INTERMEDIATE RUSSIAN (4) Emphasis on reading unsimplified texts; composition; grammatical analysis. Prerequisite: RUS 002
RUS 011 INTENSIVE BASIC RUSSIAN (6) Listening, speaking, reading, writing, and basic structures of Russian. This course is equivalent to RUS 001 and the first half of RUS 002. Students may receive credit for only one course from RUS 001, 002, and 011.
RUS 012 INTENSIVE BASIC RUSSIAN (6) Listening, speaking, reading, writing, and basic structures of Russian. This course is equivalent to the second half of RUS 002 and RUS 003. Students may receive credit for only one course from RUS 002, 003, and 012. Prerequisite: RUS 011
RUS 083S (GH;GI) FIRST-YEAR SEMINAR IN RUSSIAN (3) Russia's cultural past and present.
RUS 099 (GI) FOREIGN STUDIES (1–12)
RUS 100 (GH;GI) RUSSIAN CULTURE AND CIVILIZATION (3) The Russian people from the tenth century to present times; their literature, arts, music, science, and philosophy. In English.
RUS 110 (GH;GI) RUSSIAN FOLKLORE (3) Study of byliny, lyrical and historical songs, folktales, drama, ceremonial poetry, chants, charms, proverbs, and mythology of Russia. In English.
RUS 120 (GH;GI) THEATRICAL ARTS OF RUSSIA (3) Survey of Russian dramatic literature, including plays, operas, ballets, and cinema. In English.
RUS 130 (WMNST) WOMEN IN RUSSIAN LITERATURE (3) Survey of Russian and Soviet women characters and writers from the Medieval Period to the present (in English).
RUS 141W RUSSIAN LITERATURE IN ENGLISH TRANSLATION: 1800-1870 (3) Pushkin, Lermontov, Gogol, the critics, Turgenev, Dostoevsky, Tolstoy. Writing assignments will serve as a major way of exploring subject matter.
RUS 142W RUSSIAN LITERATURE IN ENGLISH TRANSLATION: 1870 TO PRESENT (3) Dostoevsky, Tolstoy, Chekhov, Gorky, symbolists, selected Soviet authors. Writing assignments will serve as a major way of exploring subject matter.
RUS 143 (GH;GI) (GER) THE CULTURE OF STALINISM AND NAZISM (3) The culture of Stalinist Russia and Nazi Germany in comparative perspective.
RUS 187 RUSSIAN FRESHMAN SEMINAR (3) The meaning and advantages of a Liberal Arts education in context of a specific discipline. Prerequisite: first-semester standing and enrollment in the College of the Liberal Arts
RUS 196 INDEPENDENT STUDIES (1–18)
RUS 197 SPECIAL TOPICS (1–9)
RUS 199 (GI) FOREIGN STUDIES (1–12)
RUS 204 INTERMEDIATE RUSSIAN II (4) Intensive practice of Russian reading, writing, listening and speaking; review of Russian grammar. Prerequisite: RUS 003 or RUS 012
RUS 214 INTERMEDIATE RUSSIAN III (4) Intensive practice of Russian reading, writing, listening and speaking; review of Russian grammar. Prerequisite: RUS 003 or RUS 012
RUS 221 RUSSIAN CONVERSATION (3) Practice aimed at developing fluency in the use of the grammatical constructions and vocabulary essential for everyday conversation. Prerequisite: RUS 003 or RUS 006
RUS 294 RESEARCH PROJECT (1–12)
RUS 296 INDEPENDENT STUDIES (1–18)
RUS 297 SPECIAL TOPICS (1–9)
RUS 299 (GI) FOREIGN STUDIES (1–12)
RUS 304 READINGS IN RUSSIAN III (3) Extensive reading of contemporary Russian texts, including articles from Soviet press and short fiction. Prerequisite: 6 credits of Russian at the 200 level
RUS 305 ADVANCED RUSSIAN CONVERSATION (3) Discussion and role-playing based on real-life situations and current events; supervised by a native speaker. Prerequisite: RUS 204, RUS 214
RUS 321 ADVANCED RUSSIAN STYLISTICS (3) Russian composition and discussion based on issues of contemporary Russian society. Prerequisite: 6 credits of Russian at the 200 level
RUS 360 ADVANCED RUSSIAN GRAMMAR (3) Russian morphology and syntax on an advanced level. Prerequisite: 6 credits of Russian at the 200 level
RUS 395 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
RUS 399 (GI) FOREIGN STUDIES (1–12)
RUS 400 SENIOR SEMINAR IN RUSSIAN CULTURE (3) Senior seminar devoted to topics in Russian culture; conducted in Russian. Prerequisite: RUS 204, RUS 214, RUS 304
RUS 412 RUSSIAN TRANSLATION (3 per semester, maximum of 6) Translation from Russian into English of complex texts from the humanities, social sciences, and technical fields. Prerequisite: 9 credits of Russian at the 200 level or higher
RUS 426 DOSTOEVSKY (3) Study of representative works by Dostoevsky in the original Russian. Prerequisite: 9 credits of Russian at the 200 level or higher
RUS 427 TOLSTOY (3) Study of representative works by Tolstoy in the original Russian. Prerequisite: 9 credits of Russian at the 200 level or higher

RUS 430 METHODS AND MATERIALS FOR TEACHING RUSSIAN (3) Research, analysis, and demonstration of pedagogical problems in the teaching of Russian. Prerequisite: LING 100, 9 credits of Russian at the 200 level or higher
RUS 440W (RL ST) THE ORTHODOX CHRISTIAN TRADITION (3) History, culture, and beliefs of the Eastern Orthodox religious tradition with special reference to Russia. Prerequisite: RL ST 004, RL ST 124, RL ST 125, RUS 100, or RUS 110
RUS 450 HISTORY OF THE RUSSIAN LANGUAGE (3) Relationship of Russian to other Indo-European languages and changes within Russian from the time of the earliest records to the present. Prerequisite: 9 credits of Russian at the 200 level or higher
RUS 460 LINGUISTIC ANALYSIS OF CONTEMPORARY RUSSIAN (3) Detailed study of the phonology, morphology, and syntax of Modern Standard Russian and the major dialects. Prerequisite: 9 credits of Russian at the 200 level or higher
RUS 494 RESEARCH PROJECT (1–12)
RUS 496 INDEPENDENT STUDIES (1–18)
RUS 497 SPECIAL TOPICS (1–9)
RUS 499 (GI) FOREIGN STUDIES (1–12)

SCHOOL PSYCHOLOGY (S PSY)

College of Education
S PSY 496 INDEPENDENT STUDIES (1–18)
S PSY 497, 498 SPECIAL TOPICS (1–9)

SCHOOL OF SCIENCE, ENGINEERING, AND TECHNOLOGY

College of Engineering
SSET 295 INTERNSHIP (1–18) Supervised off-campus, individual training including practical field experiences or internships where written and oral critique of the activity is required. Prerequisite: prior approval of the proposed assignment by the program
SSET 395 INTERNSHIP (1–18) Supervised off-campus, individual training including practical field experiences or internships where written and oral critique of the activity is required. Prerequisite: prior approval of the proposed assignment by the program
SSET 495 INTERNSHIP (1–18 per semester) Supervised off-campus, individual training including practical field experiences of internships where written and oral critique of the activity is required. Prerequisite: prior approval of the proposed assignement by the program

SCIENCE (SC)

Eberly College of Science
SC 100 INTRODUCTION TO RESEARCH (1) Introduces essential elements of laboratory safety, laboratory techniques, research ethics, and scientific communication skills. Especially for undergraduate research students.
SC 210 SOPHOMORE SCIENCE SEMINAR (2) Covers topics related to success in upper level courses including critical thinking, library resources, reading primary literature, and communication skills.
SC 285 SCIENCE CO-OP PREPARATION (1) Course helps students maximize value from Science Co-Op work experience; includes discussions of corporate culture and issues of business/technology. Offered for SA/UN grade. Prerequisite: third-semester standing
SC 294 RESEARCH PROJECT COURSES (1–12)
SC 295 SCIENCE CO-OP WORK EXPERIENCE I (1–9) A supervised work experience where the student is employed in a scientific position. To be offered for SA/UN grading. Prerequisite: ACCEPTANCE INTO THE EBERLY COLLEGE OF SCIENCE CO-OP PROGRAM
SC 297 SPECIAL TOPICS (1–9)
SC 395 SCIENCE CO-OP WORK EXPERIENCE II (1–9) A supervised work experience where the student is employed in a scientific position. To be offered for SA/UN grading. Prerequisite: SC 295A
SC 400 CONSEQUENCES OF SCIENCE (1) A series of lecture/discussions in which science faculty members show the social implications of their research specialty.
SC 494 RESEARCH PROJECT COURSES (1–12)
SC 495 SCIENCE CO-OP WORK EXPERIENCE III (1–9) A supervised work experience where the student is employed in a scientific position. To be offered for SA/UN grading. Prerequisite: SC 395A
SC 497 SPECIAL TOPICS (1–9)

SCIENCE EDUCATION (SCIED)

College of Education
SCIED 297, 298 SPECIAL TOPICS (1–9)
SCIED 410 USING TECHNOLOGY TO ENHANCE SCIENCE TEACHING (3) This course explores contemporary practice and research associated with applications of technology to enhance science learning and teaching. Prerequisite: admission to one of the science teaching options in SECED
SCIED 411 TEACHING SECONDARY SCIENCE I (3) Introduction to teaching secondary school science, including curriculum, learning theory, media, evaluation as they relate to student progress. Prerequisite: C I 295; appropriate courses for certification option and approval of department

SCIED 412 TEACHING SECONDARY SCIENCE II (3) Implementation of science instruction using a variety of modern approaches. Prerequisite: SCIED 410, SCIED 411 Concurrent: C I 412W
SCIED 454 SCIENCE IN EARLY CHILDHOOD EDUCATION (3) Philosophy, techniques, materials, and evaluation in teaching science to young children (N-3); a briefing of science concepts for young children.
SCIED 455 FIELD NATURAL HISTORY FOR TEACHERS (3) Ecologically oriented field study course to provide teachers with basic knowledge of natural science resources in school environments. Prerequisite: 3 credits in biological science
SCIED 457 ENVIRONMENTAL SCIENCE EDUCATION (3) Philosophy, techniques, and skills for teaching environmental science, including curriculum development, fieldwork, and the use of appropriate technologies. Prerequisite: 3 credits of calculus, 9 credits of sciences, 400-level teaching methods course
SCIED 458 TEACHING SCIENCE IN THE ELEMENTARY SCHOOL (3) Interpreting children's science experiences and guiding development of their scientific concepts; a briefing of science content material and its use. Prerequisite: LL ED 400, LL ED 401, LL ED 402, PSY 213, 3 credits each in biological, earth, and physical sciences Concurrent: C I 495A OR C I 495B; MTHED 420, SS ED 430W
SCIED 470 SELECTED STUDIES IN SCIENCE EDUCATION (1–6) Intensive work on particular issues, trends, or developments in science education for elementary and secondary school teachers. Prerequisite: Instructional I certification and teaching experience
SCIED 496 INDEPENDENT STUDIES (1–18)
SCIED 497 SPECIAL TOPICS (1–9)
SCIED 498 SPECIAL TOPICS (1–9)

SCIENCE, ENGINEERING, AND TECHNOLOGY (SE&T)

Penn State Erie, The Behrend College
SE&T 497 SPECIAL TOPICS (1–9)

SCIENCE, TECHNOLOGY, AND SOCIETY (S T S)

College of Engineering
S T S 005 (GI) (WMNST) INTRODUCTION TO WOMEN IN SCIENCE, TECHNOLOGY, AND ENGINEERING (3) The role of women and gender in science, technology, and engineering.
S T S 047 (SOC) WILDERNESS, TECHNOLOGY, AND SOCIETY (3) Impact of developments in science, literature, and art on changing attitudes toward nature; consequences for conservation, preservation, environmental ethics.
S T S 055 (GN) (AERSP) SPACE SCIENCE AND TECHNOLOGY (3) The science and technology of space exploration and exploitation; physical principles; research and development; history, space policy, and social implications.
S T S 090 INTRODUCTION TO PEACE AND CONFLICT STUDIES (3) Introduction to theory and practice concerning major contemporary issues of peace and conflict; includes anthropological, technological, psychological, and economic perspectives.
S T S 100 (GH) THE ASCENT OF HUMANITY (3) A survey of some of the intellectual achievements that highlight humanity's attempts to understand nature and shape the environment.
S T S 101 (GH) MODERN SCIENCE, TECHNOLOGY, AND HUMAN VALUES (3) Relationships of science and technology to human aspirations, values, and arts.
S T S 105 (GHA) (FD SC) FOOD FACTS AND FADS (3) Impact on society and the individual of modern food technology, food laws, additives, etc.; historical, current, and futuristic aspects.
S T S 105S (GHA) FIRST-YEAR SEMINAR (3) Impact on society and the individual of modern food technology, food laws, additives, etc.; historical, current, and futuristic aspects.
S T S 107 (GH) (PHIL) INTRODUCTION TO PHILOSOPHY OF TECHNOLOGY (3) The character of technology; its relation to human values; philosophical assumptions in its development; and how it transforms the world.
S T S 122 (GH) (HIST) HISTORY OF SCIENCE I (3) A history of science and culture from Stonehenge to the scientific revolution.
S T S 123 (GH) (HIST) HISTORY OF SCIENCE II (3) A history of science and culture from the scientific revolution to the present.
S T S 130 WORLD FOOD PROBLEMS (1–3) Critical examination of data sources, issues, and perspectives concerning contributions of science, technology, and society in resolving world food problems.
S T S 135 (GS) (PL SC) THE POLITICS OF THE ECOLOGICAL CRISIS (3) The political implications of the increasing scarcity of many of the world's resources.
S T S 150 (GN) (EM SC) OUT OF THE FIERY FURNACE (3) A history of materials, energy, and humans, with emphasis on their interrelationships. For nontechnical students.
S T S 151 (GS) (HIST) TECHNOLOGY AND SOCIETY IN AMERICAN HISTORY (3) Development of technology in America from colonial times; its reception and its influence on social, economic, and political life.
S T S 151S (GS) (HIST) TECHNOLOGY AND SOCIETY IN AMERICAN HISTORY (3) Development of technology in America from colonial times; its reception and its influence on social, economic, and political life.
S T S 197 SPECIAL TOPICS (1–9)
S T S 200 (GS) CRITICAL ISSUES IN SCIENCE, TECHNOLOGY, AND SOCIETY (3) An overview of interactions between science, technology, and society from social sciences and humanities perspectives.

S T S 200S (GS) CRITICAL ISSUES IN SCIENCE, TECHNOLOGY, AND SOCIETY (3) An overview of interactions between science, technology, and society from social sciences and humanities perspectives.
S T S 201 (GN) CLIMATE CHANGE, ENERGY, AND BIODIVERSITY (3) Studies of global warming, energy options, and biodiversity; their interrelations as sciences and as societal issues.
S T S 230 (HIST;NUTR) AMERICAN FOOD SYSTEM: HISTORY, TECHNOLOGY, AND CULTURE (3) A cultural analysis of the evolution of U.S. agricultural production and food consumption patterns, the food industry and food marketing.
S T S 233 (GH) (PHIL) ETHICS AND THE DESIGN OF TECHNOLOGY (3) Ethics and individual and group decision-making in the design of technology including design projects and specific attention to institutional ethics.
S T S 296 INDEPENDENT STUDIES (1–18)
S T S 297 SPECIAL TOPICS (1–9)
S T S 299 (GI) FOREIGN STUDIES (1–12)
S T S 327 (R SOC) SOCIETY AND NATURAL RESOURCES (3) Analysis of the relationships between societal development and enhancement and natural resources.
S T S 390 PERSONAL PEACE AND PEACE BUILDING (3) The study of inner peace, conflict resolution and consensus, peace in the community of life, and peace building. Prerequisite: S T S 090
S T S 407 (PHIL) TECHNOLOGY AND HUMAN VALUES (3) Interrelationships of twentieth-century technological change and human values. Emphasis on the social and ethical aspects of technological progress. Prerequisite: 9 credits in philosophy, including PHIL 107 or 6 credits of philosophy at the 200 level
S T S 408 (COMM) CULTURAL FOUNDATIONS OF COMMUNICATIONS (3) Examination of oral, scribal, print, industrial and electronic cultures; analysis of impact of technology on communications and social structure.
S T S 420 (EM SC;SOC) ENERGY AND MODERN SOCIETY (3) Technology and economics of energy resources, production, and consumption; environmental factors, exhaustion, new technology.
S T S 424 (BIOL;PPATH) SEEDS OF CHANGE: THE USES OF PLANTS (3) Interdisciplinary approach to the biology, chemistry, history, and culture of the interactions between plants and people. Prerequisite: BIOL 110; BIOL 220W, BIOL 230W, or BIOL 240W
S T S 428 (HIST) THE DARWINIAN REVOLUTION (3) The origins and implications of evolutionary theory. Prerequisite: AN INTRODUCTORY SCIENCE COURSE AND A HISTORY COURSE
S T S 430 (GI) (NUTR) GLOBAL FOOD STRATEGIES: PROBELMS AND PROSPECTS FOR REDUCING WORLD HUNGER (3) Technological, social, and political solutions to providing basic food needs; food resources, population, and the environment; current issues.
S T S 432 (PHIL) MEDICAL AND HEALTH CARE ETHICS (3) Examines ethical, political, and social issues in the research, implementation, and practice of medicine, medical technologies, and healthcare. Prerequisite: fifth-semester standing
S T S 433 (PHIL) ETHICS IN SCIENCE AND ENGINEERING (3) Ethical issues arising in the practice of science and engineering and their philosophical analysis.
S T S 435 (PHIL) THE INTERRELATION OF SCIENCE, PHILOSOPHY, AND RELIGION (3) The historical and transformative interactions between science and Western philosophical and religious views of nature, humanity, and God.
S T S 457 HIST;WMNST) THE HISTORY OF WOMEN IN SCIENCE (3) Critical analysis of the role women, gender, and minorities have played in the natural sciences. Prerequisite: HIST 116, HIST 117, WMNST 001, WMNST 003, OR WMNST 005
S T S 460 (PL SC) SCIENCE, TECHNOLOGY, AND PUBLIC POLICY (3) The all-pervasive importance of science and technology policy in modern societies and mechanisms and processes by which it is made. Prerequisite: three credits in Natural Sciences or Engineering, three credits in Social and Behavioral Sciences
S T S 470 TECHNOLOGY ASSESSMENT AND TRANSFER (3) Nature of technology assessment and technology transfer in product design and development process from federal and university labs, and internationally.
S T S 471 RADIATION, REACTORS, AND SOCIETY (3) Societal problems and benefits associated with nuclear power, including energy needs, radiation effects, safety, and thermal effects.
S T S 490 PEACE AND CONFLICT STUDIES SEMINAR (3) Advanced study of major contemporary issues of peace and conflict; includes anthropological, technological, psychological, and economic perspectives. Prerequisite: PL SC 014, S T S 090
S T S 494 RESEARCH PROJECT (1–12)
S T S 496 INDEPENDENT STUDIES (1–18)
S T S 497 SPECIAL TOPICS (1–9)
S T S 498 SPECIAL TOPICS (1–9)
S T S 499 (GI) FOREIGN STUDIES (1–12)

SERBO-CROATIAN (S CR)

College of the Liberal Arts

S CR 001 BEGINNING SERBO-CROATIAN (4) An elementary course to enable the student to achieve a measure of proficiency in reading and speaking Serbo-Croatian.
S CR 002 BEGINNING SERBO-CROATIAN (4) An elementary course to enable the student to achieve a measure of proficiency in reading and speaking Serbo-Croatian. Prerequisite: S CR 001

S CR 003 BEGINNING SERBO-CROATIAN (4) An elementary course to enable the student to achieve a measure of proficiency in reading and speaking Serbo-Croatian. Prerequisite: S CR 002
S CR 199, 299, 399, 499 (GI) FOREIGN STUDIES (1–12)
S CR 294, 494 RESEARCH PROJECT (1–12)
S CR 395 INTERNSHIP (1–18)

SLAVIC (SLAV)

College of the Liberal Arts
SLAV 099 (GI) FOREIGN STUDIES (1–12)
SLAV 187 SLAVIC FRESHMAN SEMINAR (3)
SLAV 197, 297, 497 SPECIAL TOPICS (1–9)
SLAV 199, 299, 399, 499 (GI) FOREIGN STUDIES (1–12)
SLAV 294, 494 RESEARCH PROJECT (1–12)
SLAV 296 INDEPENDENT STUDIES (1–18 per semester)
SLAV 395 INTERNSHIP (1–18)

SOCIAL SCIENCE (SCLSC)

Capital College
SCLSC 320 INTRODUCTION TO STATISTICS (4) Methods of collection, presentation, and analysis of quantitative data in the social sciences; procedures, interpretation, and application.
SCLSC 470 ADVANCED STATISTICAL AND DESIGN METHODS (3) Advanced techniques such as complex analyses of variance, orthogonal comparisons, trend analysis, etc., will be presented and studied. Prerequisite: SCLSC 320
SCLSC 480W QUANTITATIVE METHODS IN THE SOCIAL SCIENCES (4) Students will learn to conduct, analyze and write up quantitative social scientific research according to appropriate professional standards. Prerequisite: permission of program
SCLSC 481 QUALITATIVE RESEARCH METHODS IN THE SOCIAL SCIENCES (4) Students will learn how to conduct, analyze and write up qualitative social research according to appropriate professional standards. Prerequisite: permission of program
SCLSC 492 CURRENT TOPICS IN THE SOCIAL SCIENCES (3 credits per semester) This course allows for various current topics to be offered as suitable to the needs of the program. Prerequisite: permission of program
SCLSC 496 INDEPENDENT STUDIES (1–18)
SCLSC 497 SPECIAL TOPICS (1–9)

SOCIAL SCIENCE (SO SC)

College of the Liberal Arts
SO SC 001 (GS) URBANIZATION (3) An overview of the social sciences, including an interdisciplinary analysis of the urban process.
SO SC 002 CONTEMPORARY SOCIETY (3) Selected contemporary issues in the perspective of history, sociology, psychology, economics, and political science.
SO SC 187 SOCIAL SCIENCE FRESHMAN SEMINAR (3)
SO SC 297 SPECIAL TOPICS (1–9)

SOCIAL STUDIES EDUCATION (SS ED)

College of Education
SS ED 298 SPECIAL TOPICS (1–9)
SS ED 411 TEACHING SECONDARY SOCIAL STUDIES I (3) Teaching social studies, including individual differences, curricular overview, application of learning theories, identification and measurement of learning outcomes. Prerequisite: ANTH 045, C I 295, HIST 020, HIST 021, PL SC 001; 12 credits from history and/or geography, and/or sociology, and/or economics
SS ED 412 TEACHING SECONDARY SOCIAL STUDIES II (3) Study of the social studies teacher's role in planning instruction; strategies for implementing and assessing teaching in the social studies. Prerequisite: SS ED 411 Concurrent: C I 412W
SS ED 430W TEACHING SOCIAL STUDIES IN THE ELEMENTARY GRADES (3) Principles underlying use of social studies in the elementary school; practical demonstration of desirable methods. Prerequisite: LL ED 400, LL ED 401, LL ED 402, PSY 213, nine credits in history and the social sciences Concurrent: C I 495A or C I 495B; MTHED 420, SCIED 458
SS ED 470 ISSUES IN SOCIAL STUDIES EDUCATION (1–6) Concentration on particular issues, trends, and developments in the social studies. Prerequisite: Instructional I certificate and teaching experience
SS ED 496 INDEPENDENT STUDIES (1–18)
SS ED 497, 498 SPECIAL TOPICS (1–9)

SOCIOLOGY (SOC)

College of the Liberal Arts
*SOC 001 (GS) INTRODUCTORY SOCIOLOGY (3) The nature and characteristics of human societies and social life.

SOC 001W (GS) INTRODUCTORY SOCIOLOGY (3) The nature and characteristics of human societies and social life.
SOC 003 (GS) INTRODUCTORY SOCIAL PSYCHOLOGY (3) The impact of the social environment on perception, attitudes, and behavior.
SOC 005 (GS) SOCIAL PROBLEMS (3) Current social problems such as economic, racial, and gender inequalities; social deviance and crime; population, environmental, energy, and health problems.
SOC 007 INTRODUCTION TO SOCIAL RESEARCH (3) Fundamental concepts and problems in social science research; design, measurement, sampling, causation, validity, interpretation.
SOC 012 (GS) (ADM J;CLJ) CRIMINOLOGY (3) Explanations and measurement of crime; criminal law; characteristics of criminals and victims; violent, property, white-collar, organized, and sexual crimes.
SOC 013 (GS) (ADM J) JUVENILE DELINQUENCY (3) Juvenile conduct, causes of delinquency, current methods of treatment; organization and function of agencies concerned with delinquency.
SOC 015 (GS) URBAN SOCIOLOGY (3) City growth and decline; impact of city life on individuals, families, neighborhoods, and government; urban life-styles.
SOC 023 (GS) POPULATION AND POLICY ISSUES (3) Local, national, and international population trends; basic techniques of demographic analysis; population problems; implications for public planning and policy.
+SOC 030 (GS) SOCIOLOGY OF THE FAMILY (3) Family structure and interaction; functions of the family as an institution; cross-cultural comparisons.
SOC 035 SOCIOLOGY OF AGING (3) Introduction to the sociological study of aging.
SOC 047 (S T S) WILDERNESS, TECHNOLOGY, AND SOCIETY (3) Impact of developments in science, literature, and art on changing attitudes toward nature; consequences for conservation, preservation, environmental ethics.
SOC 055 (GS) WORK IN MODERN SOCIETY (3) The nature of work in varied occupational and organizational settings; current trends and work life in the future.
SOC 083S (GS) FIRST-YEAR SEMINAR IN SOCIOLOGY (3) Critical approaches to issues in the structure of society.
SOC 103 (GI) (AAA S;WMNST) RACISM AND SEXISM (3) Critical analysis of the structure of race and gender inequality in the contemporary United States.
SOC 109 SOCIOLOGICAL PERSPECTIVES (3) Intensive and critical analysis of the bases of the social order, change, values, knowledge, and conflict.
SOC 110 (GS;GI) (WMNST) SOCIOLOGY OF GENDER (3) Changing sex role expectations and behavior for men and women in contemporary society.
SOC 111 SOCIOLOGY OF HUMOR (3) Humor: its nature, types, and functions in society; sociological and social psychological approaches in contemporary and classic humor.
SOC 119 (GS;GI) RACE AND ETHNIC RELATIONS (4) Historical patterns and current status of racial and ethnic groups; inequality, competition, and conflict; social movements; government policy.
SOC 174 PSYCHOLOGICAL AND SOCIOLOGICAL ASPECTS OF DEATH (3) An introductory, interdisciplinary approach to the psychology and sociology of death, stressing the significance of, and attitudes toward, mortality.
SOC 187 SOCIOLOGY FRESHMAN SEMINAR (3) The meaning and advantages of a Liberal Arts education in context of a specific discipline. Prerequisite: first-semester standing and enrollment in the College of the Liberal Arts
SOC 197 SPECIAL TOPICS (1–9)
SOC 207 RESEARCH METHODS IN SOCIOLOGY (3) Experiential-based course covering the four main social research methods: available data, survey research, experiments, and field research. Prerequisite: 3 credits in Sociology
SOC 287W INTERCULTURAL COMMUNITY BUILDING (3) An intercultural analysis of diversity issues.
SOC 294 RESEARCH PROJECT (1–12)
SOC 296 INDEPENDENT STUDIES (1–18)
SOC 297 SPECIAL TOPICS (1–9)
SOC 298 SPECIAL TOPICS (1–9)
SOC 300 PRECEPTORSHIP IN SOCIOLOGY (1–4 per semester, maximum of 8) Supervised experience as a teaching assistant under the supervision of an approved faculty member. Prerequisite: 3 credits in course work related to the subject of the course
SOC 309 SOCIOLOGY OF HEALTH (3) Sociological concepts and principles operative in public and private areas of health and illness, including cultural, ethnic, and ecological factors. Prerequisite: 3 credits in Sociology
SOC 381H JUNIOR HONORS SEMINAR IN SOCIOLOGY (1) Supervised experience in planning the honors thesis and a sociological career. Prerequisite: sociology major, junior standing, and admission to the Schreyer Honors College
SOC 395 INTERNSHIP (1–6) Supervised off-campus, non-group instruction including individual field experiences, practicums or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
SOC 400W SENIOR RESEARCH SEMINAR (3) Major concepts and principles of sociology through reading, data analysis, and writing. Capstone course for senior Sociology majors. Prerequisite: SOC 470
SOC 401 SOCIAL INSTITUTIONS (3) Development, nature, and function of major social institutions and their impact on individual life in modern society. Prerequisite: 6 credits in Sociology

SOC 403 ADVANCED SOCIAL PSYCHOLOGY (3) Analysis of the major theoretical approaches and research findings of contemporary social psychology. Prerequisite: SOC 003

SOC 404 SOCIAL INFLUENCE AND SMALL GROUPS (3) The study of social influence, leadership and status, and social cohesion and commitment processes in small groups. Prerequisite: SOC 003 or PSY 417

SOC 405 SOCIOLOGICAL THEORY (3) Overview of the development of sociological theory; current issues and controversies. Prerequisite: 3 credits in the Sociology

SOC 406 (ADM J;CLJ) SOCIOLOGY OF DEVIANCE (3) Theory and research concerning deviant behaviors and lifestyles viewed as significant departures from a group's normative expectations. Prerequisite: SOC 005, SOC 012, or SOC 013

SOC 408 URBAN ECOLOGY (3) Spatial and temporal aspects of urban structure; urban growth, neighborhoods, racial and ethnic groups, mental illness; cross-cultural perspectives. Prerequisite: 3 credits in sociology

SOC 409 (GI) (AAA S) RACIAL AND ETHNIC INEQUALITY IN AMERICA (3) The impact of inequality and discrimination on individual and group identity among various racial and ethnic groups. Prerequisite: 3 credits in Sociology

SOC 412 (ADM J) CRIME, SOCIAL CONTROL, AND THE LEGAL SYSTEM (3) Legal and extralegal control; public opinion on crime; criminal justice and correctional processes; legal sanctions; control strategies. Field trip. Prerequisite: SOC 005, SOC 012, OR SOC 013

SOC 413 (CLJ) ADVANCED CRIMINOLOGICAL THEORY (3) This course provides an in-depth look at theories of crime and examines influential empirical studies designed to these theories. Prerequisite: SOC 012

SOC 414 (ADM J) CRIMINAL CAREERS AND THE ORGANIZATION OF CRIME (3) Research on and theory of criminal careers and crime organizations, emphasizing recruitment and disengagement; offender characteristics and life- styles; policy implications. Prerequisite: SOC 005, SOC 012, OR SOC 013

SOC 416 (EDTHP) SOCIOLOGY OF EDUCATION (3) The theoretical, conceptual, and descriptive contributions of sociology to education. Prerequisite: 3 credits in Sociology

SOC 419 RACE AND PUBLIC POLICY (3) Seminar format course in which sociological theory and research are applied to current race policy issues. Prerequisite: 3 credits in Sociology

SOC 420 (EM SC;S T S) ENERGY AND MODERN SOCIETY (3) Technology and economics of energy resources, production, and consumption; environmental factors, exhaustion, new technology. Prerequisite: 3 credits in Sociology

SOC 422 WORLD POPULATION DIVERSITY (3) Survey of world diversity in national population growth/composition; the impacts of demographic change on the economic/social life of nations/people. Prerequisite: 3 credits in Sociology

SOC 423 SOCIAL DEMOGRAPHY (3) Social demographic perspectives on fertility, mortality, morbidity, migration, population density, demographic transitions, social mobility, family, the aged, and minorities. Prerequisite: SOC 023 or SOC 422

SOC 424 SOCIAL CHANGE (3) Critical review of classical and recent theories of social change, emphasizing the transformations occurring in the modern world. Prerequisite: 3 credits in sociology

SOC 428 HOMELESSNESS IN AMERICA (3) Survey of social science research on homelessness in the contemporary United States. Prerequisite: 3 credits in Sociology

SOC 429 SOCIAL STRATIFICATION (3) Structure and dynamics of class, caste, and status systems; class differentials and social mobility; current theoretical and methodological issues. Prerequisite: 3 credits in sociology

SOC 430 FAMILY IN CROSS-CULTURAL PERSPECTIVE (3) Sociological analysis of family systems in various cultures and subcultures. Prerequisite: 3 credits in Sociology

SOC 431 (HD FS) FAMILY DISORGANIZATION: STRESS POINTS IN THE CONTEMPORARY FAMILY (3) Focuses on divorce, remarriage, incest, family violence as well as problems associated with family formation and parent-child relations. Prerequisite: 6 credits of human development and family studies, psychology, or sociology

SOC 432 SOCIAL MOVEMENTS (3) Why and how people mobilize to promote or retard social change. Factors predicting success or failure of social movements. Prerequisite: 3 credits in sociology

SOC 435 (HD FS) SOCIAL GERONTOLOGY (3) An analysis of the demographic, social, and cultural factors affecting the aged population in American society. Prerequisite: 3 credits in Sociology

SOC 436 POLLING AND PUBLIC OPINION (4) Methods of public opinion polling; attitude theory and research. Prerequisite: 3 credits in Sociology

SOC 437 BIOSOCIAL PERSPECTIVES ON THE FAMILY (3) The implications of knowledge from behavioral endocrinology, behavior genetics, and evolutionary psychology for understanding family relationships and child development. Prerequisite: six credits of SOC or HD FS

SOC 440 FAMILY POLICY (3) An in-depth examination of family policy. Prerequisite: 3 credits of SOC or HD FS

SOC 444 COMPLEX ORGANIZATIONS (3) Analysis of the nature and types of complex organizations and their impact on the social life of modern nations. Prerequisite: 3 credits in sociology

SOC 446 POLITICAL SOCIOLOGY (3) Sociological analysis of types of political organization and their relations with other elements of social life. Prerequisite: 3 credits in sociology

SOC 447 (COM S) ENVIRONMENT, ENERGY, AND SOCIETY (3) Sociological perspectives on causes and consequences of natural resource scarcity and pollution, with emphasis on environmental policies in industrial societies. Prerequisite: 3 credits in Sociology

SOC 454 THE CITY IN POSTINDUSTRIAL SOCIETY (3) Postindustrial social organization in the United States and Europe; consequences for metropolitan social stratification, community power, and environmental quality. Prerequisite: 3 credits in Sociology
SOC 455 WORK AND OCCUPATIONS (3) Work and occupational life in modern society; work in the past, present, and future. Prerequisite: 3 credits in sociology
SOC 456 (WMNST) GENDER, OCCUPATIONS, AND PROFESSIONS (3) The role of gender in shaping contemporary North American patterns of employment, occupational roles, and statuses. Prerequisite: WMNST 001 or 3 credits in Sociology
SOC 461 (RL ST) SOCIOLOGY OF RELIGION (3) Contemporary religion in the United States: beliefs, structure, and function of major denominations and religious cults. Prerequisite: 3 credits in sociology or religious studies
SOC 467 (CLJ;ADM J) LAW AND SOCIETY (3) Law and society studies the social origins of law and legal systems; occupational careers, and decision-making of legal officials. Prerequisite: CLJ 113, ADM J 240W
SOC 470 INTERMEDIATE SOCIAL STATISTICS (4) Descriptive and inferential statistics in social research: central tendency and variation, normal distribution, measures of association, confidence intervals, hypothesis testing. Prerequisite: SOC 207
SOC 471 QUALITATIVE RESEARCH METHODS IN SOCIOLOGY (3) Theory, methods, and practice of qualitative data collection, including observation, participant observation, interviewing; supervised projects in natural settings. Prerequisite: 3 credits in Sociology
SOC 481H SENIOR HONORS SEMINAR IN SOCIOLOGY (1) Supervised experience in planning and writing the honors thesis. Prerequisite: sociology major, senior standing, and admission to the Schreyer Honors College
SOC 494 RESEARCH PROJECT (1–12)
SOC 495 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
SOC 496 INDEPENDENT STUDIES (1–18)
SOC 497 SPECIAL TOPICS (1–9)
SOC 499 (GI) FOREIGN STUDY—SOCIOLOGY (2–6) Study, in selected foreign countries, of groups, institutions, and social problems. Prerequisite: 3 credits in Sociology
*Students may take only one course for General Education credit from SOC 001 GS or R SOC 011 GS.
+Students may take only one course for

SOCIOLOGY (SOCIO)

Capital College
SOCIO 372 SOCIAL CONFLICT (3) An analysis of the variables affecting intergroup and international conflict and cooperation. Prerequisite: general behavioral science, general psychology, or general sociology
SOCIO 384 SOCIAL PROBLEMS (3) The courses, interrelationships and possible solutions to major social problems facing the world.
SOCIO 404 POLITICAL SOCIOLOGY (3) Genesis, location, distribution, and legitimation of power as a function of the social order of nations, communities, and interest groups. Prerequisite: general sociology
SOCIO 430 SOCIAL CHANGE (3) Analysis of recent social changes including consideration of social forces accelerating and retarding change. Prerequisite: general behavioral science, general psychology, or general sociology
SOCIO 440 URBAN SOCIOLOGY (3) Focusing on economy, history, politics, geography and sociology of cities. When individual themes are used, subtitles will be added. Prerequisite: general sociology
SOCIO 462 PERSPECTIVES ON AGING (3) A study of the social, psychological, and political needs and services that are required by the elderly.
SOCIO 463 THE FAMILY (3) An introduction to the study of the family including historical perspective; cross-cultural comparisons. Prerequisite: general sociology
SOCIO 470 ENVIRONMENTAL SOCIOLOGY (3) Examination of the relationship between the physical environment and society. Prerequisite: 60 credits, at least 9 of which are in the social sciences, graduate status, or permission of the program
SOCIO 471 ENVIRONMENTAL MOVEMENTS (3) Comparative exploration of environmental movements within the context of classical and new social movement theory. Prerequisite: 90 credits, at least 9 of which are in the social sciences or which include SOCIO/CMPSY 470, graduate status, or permission of the program
SOCIO 472 JUSTICE AND THE ENVIRONMENT (3) Considers notions of justice in relation to environmental philosophy, environmental movements, and general environmental concerns. Prerequisite: 90 credits, graduate status, or permission of the program
SOCIO 484 CRIMINOLOGY (3) Review of the major social theories of crime causation and of social policies which have been advanced to diminish crime. Prerequisite: general sociology
SOCIO 486 MOOD-ALTERING SUBSTANCES IN SOCIETY (3) Perspectives of cultures throughout the world toward mood-altering substances are reviewed in light of public policy, benefits, and problems.
SOCIO 488 SOCIOLOGICAL THEORY: PAST AND PRESENT (3) Provides students with working knowledge of the major sociological theories: structural-functionalism, conflict theory, symbolic interaction, phenomenological sociology, and ethnomethodology. Prerequisite: general sociology

SOIL SCIENCE (SOILS)

College of Agricultural Sciences

SOILS 100 SOIL JUDGING (1 per semester, maximum of 3) Techniques of describing soil properties, classifying soils taxonomically, land use interpretations based on soil characteristics. Extensive field examination of soils.

SOILS 101 INTRODUCTION TO SOILS (3) A study of the characteristics of soils and their influence on land use, environmental quality, and plant growth.

SOILS 190 PROFESSIONAL DEVELOPMENT IN ENVIRONMENTAL SOIL SCIENCE (1) Development of learning goals and an introduction to faculty and alumni contacts, student portfolios, the senior thesis, and internship opportunities.

SOILS 401 SOIL COMPOSITION AND PHYSICAL PROPERTIES (3) Advanced study of mineralogical and physical properties of soils which affect soil-plant-water relationships. Prerequisite: SOILS 101

SOILS 402 CHEMISTRY OF SOILS AND FERTILIZERS (3) Chemical properties of soils; reactions of chemical and organic fertilizers as they affect ion availability. Laboratory emphasizes soil-plant relationships. Prerequisite: CHEM 013, SOILS 101

SOILS 412W SOIL ECOLOGY (3) Introduction to soil organisms; includes interactions between organisms, their processes, and metabolism with a major focus on microorganisms. Prerequisite: BIOL 011, BIOL 027, or BIOL 110

SOILS 415 SOIL MORPHOLOGY, MAPPING, AND LAND USE (3) Soil profile, soil mapping, application of principles of soil morphology and mapping to land use; remote sensing. Prerequisite: GEOSC 001, GEOSC 020, GEOSC 071, or SOILS 101

SOILS 416 SOIL GENESIS AND CLASSIFICATION (3) Pedological evolution, classification, and world distribution of soils. Prerequisite: SOILS 101

SOILS 418 (AGECO;AN SC) NUTRIENT MANAGEMENT IN AGRICULTURAL SYSTEMS (3) Comprehensive review of nutrient flow in animal agricultural systems, environmental regulations, and environmental stewardship practices.

SOILS 419 (GEOSC) SOIL ENVIRONMENTAL CHEMISTRY (4) Introduction to chemical constituents and processes occurring in soils. Topics include mineral weathering, soil solution chemistry and adsorption of solutes. Prerequisite: CHEM 013

SOILS 420 REMEDIATION OF CONTAMINATED SOILS (3) Basic principles and technical aspects of remediation of contaminated soils. Prerequisite: CHEM 013

SOILS 422 CONSERVATION OF SOIL AND WATER RESOURCES (3) Water and wind erosion processes, principles of control practices, and training in conservation planning. Prerequisite: SOILS 101

SOILS 450 ENVIRONMENTAL GEOGRAPHIC INFORMATION SYSTEMS (3) Use of geographic information systems (GIS) and digital spatial databases to characterize landscapes for environmental assessment and management. Prerequisite: SOILS 101

SOILS 489 SUPERVISED EXPERIENCE IN COLLEGE TEACHING (1–3) Participate with instructors in teaching an undergraduate soil science course; assist with teaching and evaluation and with development of instrucitonal materials. Prerequisite: SOILS 101, approval of instructor

SOILS 490 (AGRO) COLLOQUIUM (1) Continuing written and oral presentations developed by students in consultation with the course instructor. Prerequisite: seventh-semester standing

SOILS 494 SENIOR THESIS (1–6) Supervised data collection and analysis on a topic of interest to the student culminating in a formal thesis. Prerequisite: permission of the course coordinator

SOILS 495 INTERNSHIP (1–18)

SOILS 496 INDEPENDENT STUDIES (1–18)

SOILS 497 SPECIAL TOPICS (1–9)

SPANISH (SPAN)

SPAN 001 ELEMENTARY SPANISH I (4) Audio-lingual approach to basic Spanish; writing. Students who have received high school credit for two or more years of Spanish may not schedule this course for credit, without the permission of the department.

SPAN 001G ELEMENTARY SPANISH FOR GRADUATE STUDENTS (3) Instruction in fundamental skills required for reading expository Spanish prose; primarily for advanced degree language requirements. Prerequisite: graduate standing

SPAN 002 ELEMENTARY SPANISH II (4) Audio-lingual approach to basic Spanish continued; writing. Students who have received high school credit for four years of Spanish may not schedule this course for credit, without the permission of the department. Prerequisite: SPAN 001

SPAN 002G ELEMENTARY SPANISH FOR GRADUATE STUDENTS (3) Continuation of SPAN 001G, with opportunity for reading in special fields. Prerequisite: SPAN 001G, graduate standing

SPAN 003 INTERMEDIATE SPANISH (4) Audio-lingual review of structure; writing; reading. Prerequisite: SPAN 002

SPAN 010 INTENSIVE SPANISH (6) Basic Spanish grammar, oral, aural, and writing skills (essentially equivalent to SPAN 001 and first half of SPAN 002).

SPAN 020 INTENSIVE SPANISH (6) Basic and intermediate Spanish grammar, oral, aural, and writing skills (essentially equivalent to second half of SPAN 002 and all of SPAN 003). Prerequisite: SPAN 010

SPAN 083S (GH;GI) FIRST-YEAR SEMINAR IN HISPANIC LITERATURES AND CULTURES (3) Introduction to the study of Hispanic literatures and cultures.
SPAN 099 (GI) FOREIGN STUDIES (1–12)
SPAN 100 INTERMEDIATE GRAMMAR AND COMPOSITION (3) An intermediate level grammar review that also incorporates directed and original composition exercises. Prerequisite: SPAN 003 or placement
SPAN 100A INTERMEDIATE GRAMMAR AND COMPOSITION FOR SPANISH BILINGUALS (3) A review of grammar and practice with composition focusing on needs and problems specific to Spanish-speaking bilinguals. Prerequisite: PLACEMENT
SPAN 105 SPANISH FOR STUDENTS IN THE FIELD OF AGRICULTURAL SCIENCES (4) Develop communication skills and cultural awareness to assist and work with Hispanics whose first and sometimes only language is Spanish.
SPAN 110 INTERMEDIATE CONVERSATION (3) Practice in oral expression in Spanish, with emphasis on aural comprehension, idiomatic usage, and fluency. Use of journalistic materials. Prerequisite: SPAN 003 or placement
SPAN 120 INTERMEDIATE READING (3) Emphasis on rapid reading comprehension. Selected readings from contemporary Hispanic literature, social sciences, current events, etc. Prerequisite: SPAN 003 or placement
SPAN 130 (GH) IBERIAN CIVILIZATION (3) Spanish and Portuguese life from the medieval period to the present; literature, the arts, and contemporary problems in historical perspective.
SPAN 131 (GH;GI) IBERO-AMERICAN CIVILIZATION (3) Spanish American and Brazilian life from the Conquest to the present; literature, art, the indigenous heritage, and contemporary problems.
SPAN 131W (GH;GI) IBERO-AMERICAN CIVILIZATION (3) Spanish American and Brazilian life from the Conquest to the present; literature, art, the indigenous heritage, and contemporary problems.
SPAN 132 (GI) (AAA S) AFRO-HISPANIC CIVILIZATION (3) A general introduction to human and cultural elements of African origin in Spanish- and Portuguese-speaking countries of Latin America.
SPAN 187 SPANISH FRESHMAN SEMINAR (3) The meaning and advantages of a Liberal Arts education in context of a specific discipline. Prerequisite: first-semester standing and enrollment in the College of the Liberal Arts
SPAN 197 SPECIAL TOPICS (1–9)
SPAN 199 (GI) FOREIGN STUDY—BEGINNING CONVERSATIONAL SPANISH (3) Grammar review and practice in oral expression and aural comprehension.
SPAN 200 INTENSIVE GRAMMAR AND COMPOSITION (3) Intensive grammar review; composition. Designed primarily for majors and prospective majors. Prerequisite: SPAN 100 or by placement
SPAN 210 READINGS IN IBERIAN CIVILIZATION (3) Intermediate level Spanish readings dealing with Iberian life from pre-historic times to the present. Prerequisite: SPAN 200
SPAN 220 READINGS IN IBERO-AMERICAN CIVILIZATION (3) Intermediate level Spanish readings dealing with Ibero-American life from the pre-conquest to the present. Prerequisite: SPAN 200
SPAN 230 (GH) MASTERPIECES OF SPANISH LITERATURE IN ENGLISH TRANSLATION (3) Study of works and authors of international importance; lectures, readings, and written works in English.
SPAN 231 (GH;GI) MASTERPIECES OF SPANISH AMERICAN LITERATURE IN ENGLISH TRANSLATION (3) Emphasis on works and authors of international importance. Lectures, readings, and written work in English.
SPAN 253 INTRODUCTION TO HISPANIC LITERATURE (3) Introduction to generic distinctions, critical methods, and approaches to Hispanic literature. Prerequisite: SPAN 200
SPAN 294 RESEARCH PROJECT (1–12)
SPAN 296 INDEPENDENT STUDIES (1–18 per semester)
SPAN 297 SPECIAL TOPICS (1–9)
SPAN 299 (GI) FOREIGN STUDY—INTERMEDIATE CONVERSATIONAL SPANISH (3) Grammar review and practice in oral expression and aural comprehension.
SPAN 300W ADVANCED GRAMMAR AND COMPOSITION THROUGH READING (3) Development of advanced grammar and composition skills through reading texts by native speakers and adapting their techniques for original compositions. Prerequisite: SPAN 200
SPAN 301W ADVANCED WRITING AND STYLISTICS IN SPANISH FOR SPANISH SPEAKERS (3) This course will enhance writing proficiency in Spanish of Spanish speaking students by targeting common problems characteristic of Spanish speakers. Prerequisite: SPAN 100A or SPAN 200
SPAN 305 SPANISH FOR SOCIAL SERVICES (3) Practical Spanish for social workers, medical personnel, law enforcement officers, etc.; emphasis on Puerto Rican vocabulary, idiom, and pronunciation. Prerequisite: SPAN 200
SPAN 353 SURVEY OF SPANISH LITERATURE BEFORE 1700 (3) Selected major works of prose, poetry, and drama from the Middle Ages to the end of the seventeenth century. Prerequisite: SPAN 253
SPAN 354 SURVEY OF SPANISH LITERATURE SINCE 1700 (3) Selected major works of prose, poetry, and drama from the eighteenth century to the present. Prerequisite: SPAN 253
SPAN 355 SURVEY OF SPANISH AMERICAN LITERATURE THROUGH "MODERNISMO" (3) Selected major works of prose, poetry, and drama from the discovery through "modernismo". Prerequisite: SPAN 253
SPAN 356 SURVEY OF SPANISH AMERICAN LITERATURE AFTER "MODERNISMO" (3) Historical survey of the major figures and periods in Spanish American literature after "modernismo". Prerequisite: SPAN 253

SPAN 395 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
SPAN 397 SPECIAL TOPICS (1–9)
SPAN 399 (GI) FOREIGN STUDY—SPANISH (1–12) Advanced training in Spanish language skills. Prerequisite: SPAN 003
SPAN 410 ADVANCED ORAL EXPRESSION AND COMMUNICATION (3) Emphasis on achieving practical command of spoken Spanish and the comprehension of native speech. Use of journalistic materials. Prerequisite: SPAN 200
SPAN 412 TRANSLATION (3) Techniques of oral and written translation from Spanish to English and vice versa, particularly for business, literature, and social work. Prerequisite: SPAN 300W
SPAN 414 SPANISH PHONOLOGY (3) Spanish phonetics and phonemics; systematic means of correcting pronunciation defects; other audio-lingual applications. Prerequisite: SPAN 200
SPAN 415 SPANISH MORPHOLOGY AND SYNTAX (3) The Spanish grammatical system; analysis of morphemic units and their organization into syntactic structures. Prerequisite: SPAN 200
SPAN 418 THE EVOLUTION OF SPANISH (3) The emergence and development of the sounds and forms of Spanish. Prerequisite: SPAN 414
SPAN 420 SPANISH FOR BUSINESS AND INTERNATIONAL TRADE (3) Introduction to the Spanish of international business and to the social and cultural norms of negotiation in Spanish-speaking countries. Prerequisite: SPAN 300W
SPAN 439 DON QUIJOTE (3) Thorough study of the masterpiece, including its sources, genesis, language, style, success, and influence. Prerequisite: SPAN 300W
SPAN 440 TEACHING OF ROMANCE LANGUAGES (3) Theories of second language acquisition. Current classroom practices in the teaching of Romance languages. Prerequisite: SPAN 200
SPAN 472 THE CONTEMPORARY SPANISH AMERICAN NOVEL (3) The regionalist and social novel since 1910, together with the social background. Prerequisite: SPAN 300W, SPAN 354
SPAN 476 MASTERPIECES OF SPANISH AMERICAN LITERATURE (3) Reading, analysis, and discussion of selected major works representative of Spanish American prose and poetry. Prerequisite: SPAN 253, SPAN 300W
SPAN 490 MASTERPIECES OF SPANISH PROSE (3) Reading, analysis, and discussion of selected masterpieces of Spanish novels, short stories, etc. Prerequisite: SPAN 253, SPAN 300W
SPAN 491 MASTERPIECES OF SPANISH DRAMA AND POETRY (3) Reading, analysis, and discussion of selected masterpieces of Spanish drama and poetry. Prerequisite: SPAN 253, SPAN 300W
SPAN 494 RESEARCH PROJECT (1–12)
SPAN 496 INDEPENDENT STUDIES (1–18)
SPAN 497 SPECIAL TOPICS (1–9)
SPAN 499 (GI) FOREIGN STUDY—SPANISH (1–12) Contemporary Spanish life and civilization. Emphasis on post-Civil War period: literature, arts, and sociopolitical problems. Prerequisite: SPAN 100, SPAN 110, or SPAN 120

SPANISH STUDIES (SP ST)

Capital College

SP ST 315 BASIC SPANISH I (3) Conversational approach to Spanish, stressing basic patterns of speech, reading, and writing. Insights into Hispanic life, culture, and cuisine. Use of language laboratory.
SP ST 330 BASIC BUSINESS SPANISH (3) Conversational approach, emphasizing basic business vocabulary and situations. Practice in speaking, reading and writing. Use of language laboratory.
SP ST 497 SPECIAL TOPICS (1–9)

SPECIAL EDUCATION (SPLED)

College of Education

SPLED 296 INDEPENDENT STUDIES (1–18)
SPLED 297, 298 SPECIAL TOPICS (1–9)
SPLED 395W OBSERVING IN EXCEPTIONAL SETTINGS (3) Observations of exceptional persons and techniques used by their teachers in a variety of settings, e.g., school, day care, vocational. Prerequisite: EDPSY 101. PA Act 34 clearance required. In addition, non-Pennsylvania residents must provide evidence of an FBI background information check. (Forms: 228 Chambers) Concurrent: SPLED 425
SPLED 400 TEACHING EXCEPTIONAL STUDENTS IN GENERAL EDUCATION SETTINGS (3) Educational rights, characteristics, identification procedures, and instructional practices for exceptional students with prereferral and mainstreaming as an emphasis. Not open to Special Education majors. Prerequisite: EDPSY 014
SPLED 401 MOTIVATING EXCEPTIONAL LEARNERS (4) Group and individual techniques to promote student task engagement and prosocial behavior. Prerequisite: or concurrent: a grade of C or better required in SPLED 395W
SPLED 402 HUMAN RIGHTS: HISTORICAL AND CURRENT ISSUES IN SPECIAL EDUCATION (3) Litigation, legislation, regulation, and advocacy issues impacting on educational and related services for individuals with academic and/or physical disabilities. Prerequisite: or concurrent: SPLED 400 or SPLED 425

SPLED 404 WORKING WITH FAMILIES AND PROFESSIONALS IN SPECIAL EDUCATION (3) Strategies for productive interactions between special educators and others such as colleagues, employers, parents, service providers, professionals, and students. Prerequisite: or concurrent: a grade of C or better required in SPLED 425
SPLED 409 CURRICULUM FOR STUDENTS WITH SPECIAL NEEDS (6) Effective curriculum and materials to educate students with special needs. Prerequisite: a grade of C or better required in MATH 200, SPLED 395W, SPLED 401, SPLED 412, SPLED 425, SPLED 454, SPLED 495E Concurrent: a grade of C required in SPLED 495G
SPLED 411 INTERVENTION FOR STUDENTS WITH SEVERE DISABILITIES (3) Assessment, teaching strategies, curricula, materials, and assistive techniques for use with individuals having severe disabilities (mental and physical). Prerequisite: a grade of C or better required in SPLED 395W, SPLED 401, SPLED 425 Concurrent: a grade of C or better in SPLED 495E
SPLED 412 INSTRUCTION FOR STUDENTS WITH MILD DISABILITIES (4) Appropriate teaching strategies, curriculum sequences, and materials selection and evaluation for children with mild special needs. Prerequisite: a grade of C or better required in SPLED 395W, SPLED 401, SPLED 425, SPLED 454 Concurrent: a grade of C or better required in SPLED 495E
SPLED 415 EARLY SPECIAL EDUCATION (3–4) Includes early identification methods, assessment, curricula, parent involvement, and program evaluation for exceptional preschoolers in mainstreamed or segregated settings. Prerequisite: a grade of C or better required in the following courses C & S 401 or SPLED 454; a course in child development
SPLED 418 TECHNOLOGIES FOR PERSONS WITH DISABILITIES (2) Sensory aids, communication systems, computer systems, expert systems, simulations, and other technologies for students who are academically or physically challenged. Prerequisite: SPLED 400 or SPLED 425
SPLED 425 ORIENTATION TO HUMAN VARIATION AND SPECIAL EDUCATION SERVICES (3) An intensive overview of exceptional individuals being served in special education programs across their life-spans, from infancy through adulthood. Prerequisite: upper division student status; declaration of major in Special Education
SPLED 444 INCLUSIVE EDUCATION AND ASSESSMENT (6) Knowledge and skills needed to educate students with special needs in urban schools. Prerequisite: URBED 400 Concurrent: URBED 395W
SPLED 454 ASSESSMENT FOR INSTRUCTION (4) Orientation to evaluation of special students with emphasis on the creation, use, and interpretation of teacher-made assessment procedures. Prerequisite: a grade of C or better required in EDPSY 101, SPLED 395W, SPLED 425 Concurrent: a grade of C or better in SPLED 412, SPLED 495E
SPLED 495E EXPERIENCE WITH EXCEPTIONAL CHILDREN (3) Supervised activities with exceptional children in a variety of possible settings, e.g., schools, institutions, day care centers, vocational settings. Prerequisite: a grade of C or better required in SPLED 395W, SPLED 401, SPLED 425 SPLED 454. PA Act 34 clearance required. In addition, non-Pennsylvania residents must provide evidence of an FBI background information check. (Forms: 228 Chambers) Concurrent: a grade of C or better in SPLED 411, SPLED 412
SPLED 495F PRACTICUM IN SPECIAL EDUCATION (15) Teaching experience with mildly/moderately disabled children in age appropriate settings, e.g., infant/preschools, schools, vocational/job sites. Prerequisite: a grade of C or better required in SPLED 495G. PA Act 34 clearance required. In addition, non-Pennsylvania residents must provide evidence of an FBI background information check. (Forms: 228 Chambers)
SPLED 495G EXPERIENCE WITH AN INTEGRATED INCLUSION CLASSROOM (3) Supervised teaching in integrated general classrooms with activities in assessment, diagnosis, and direct intervention with students in need or with disabilities. Prerequisite: a grade of C or better required in SPLED 305, SPLED 395W, SPLED 401, SPLED 412, SPLED 454, SPLED 495E. PA Act 34 clearance required. In addition, non-Pennsylvania residents must provide evidence of an FBI background information check (Forms: 228 Chambers). Concurrent: a grade of C or better required in SPLED 409
SPLED 496 INDEPENDENT STUDIES (1–18)
SPLED 497, 498 SPECIAL TOPICS (1–9)

STATISTICS (STABD)

Penn State Erie, The Behrend College
STABD 296 INDEPENDENT STUDIES (1–18)
STABD 297 SPECIAL TOPICS (1–9)
STABD 303 STATISTICAL ANALYSIS I (3) Descriptive statistics, probability, discrete and continuous distributions, estimation and hypothesis testing for single samples. Prerequisite: MATH 140
STABD 404 STATISTICAL ANALYSIS II (3) Two-sample problems, single and multifactor ANOVA, simple and multiple regression, categorical data. Prerequisite: STABD 303 or STAT 301
STABD 443 REGRESSION ANALYSIS (3) Simple and multiple regression, diagnostics, matrix approach to general linear models, nonlinear models, simple and multiple correlation. Prerequisite: 6 credits in statistics
STABD 444 ANALYSIS OF VARIANCE (3) Analysis of variance for single and multifactor designs; response surface methodology. Prerequisite: STABD 303 or 200, or STAT 301
STABD 494 RESEARCH PROJECT (1–12) Prerequisite: 6 credits in statistics
STABD 495 INTERNSHIP (1–18) Prerequisite: 6 credits in statistics
STABD 496 INDEPENDENT STUDIES (1–18)
STABD 497 SPECIAL TOPICS (1–9)

STATISTICS (STAT)

Eberly College of Science

STAT 100 (GQ) STATISTICAL CONCEPTS AND REASONING (3) Introduction to the art and science of decision making in the presence of uncertainty.

STAT 100S (GQ) STATISTICAL CONCEPTS AND REASONING (3) Introduction to the art and science of decision making in the presence of uncertainty.

STAT 199 (GI) FOREIGN STUDIES (1–12)

STAT 200 (GQ) ELEMENTARY STATISTICS (4) Descriptive statistics, frequency distributions, probability, binomial and normal distributions, statistical inference, linear regression, and correlation. Prerequisite: 2 units in algebra

STAT 200P ELEMENTARY STATISTICS (4) Descriptive statistics, frequency distributions, probability, binomial and normal distributions, statistical inference, linear regression, and correlation.

STAT 220 BASIC STATISTICS FOR QUANTITATIVE STUDENTS (3) Descriptive statistics, probability, binomial and normal distributions, one and two sample models, introduction to regression, ANOVA and contingency tables. Students may only take one course from STAT 200, 220, and 250 for credit. Prerequisite: MATH 140

STAT 240 INTRODUCTION TO BIOMETRY (3) Statistical analysis, sampling, and experimentation in the agricultural sciences; data collection, descriptive statistics, statistical inference, regression, one factor AOV, probability. Students may take only one course from STAT 200, 220, 240, 250 for credit. Prerequisite: 3 credits in mathematics

STAT 250 (GQ) INTRODUCTION TO BIOSTATISTICS (3) Statistical analysis and interpretation of data in the biological sciences; probability; distributions; statistical inference for one- and two-sample problems. Prerequisite: 3 credits in mathematics

STAT 297 SPECIAL TOPICS (1–9)

STAT 301 (GQ) STATISTICAL ANALYSIS I (3) Probability concepts; nature of statistical methods; elementary distribution and sampling theory; fundamental ideas relative to estimation and testing hypotheses. Prerequisite: 3 credits of calculus

STAT 318 (MATH) ELEMENTARY PROBABILITY (3) Combinatorial analysis, axioms of probability, conditional probability and independence, discrete and continuous random variables, expectation, limit theorems, additional topics. Students who have passed either STAT(MATH) 414 or 418 may not schedule this course for credit. Prerequisite: MATH 141

STAT 319 (MATH) APPLIED STATISTICS IN SCIENCE (3) Statistical inference: principles and methods, estimation and testing hypotheses, regression and correlation analysis, analysis of variance, computer analysis. Students who have passed STAT (MATH) 415 may not schedule this course for credit. Prerequisite: STAT 318 or knowledge of basic probability

STAT 399 (GI) FOREIGN STUDIES (1–12)

STAT 401 EXPERIMENTAL METHODS (3) Random variables; probability density functions; estimation; statistical tests, t-tests; correlation; simple linear regression; one-way analysis of variance; randomized blocks. Prerequisite: MATH 111 or MATH 141

STAT 414 (MATH) INTRODUCTION TO PROBABILITY THEORY (3) Probability spaces, discrete and continuous random variables, transformations, expectations, generating functions, conditional distributions, law of large numbers, central limit theorems. Students may take only one course from STAT(MATH) 414 and 418. Prerequisite: MATH 230 or MATH 231

STAT 415 (MATH) INTRODUCTION TO MATHEMATICAL STATISTICS (3) A theoretical treatment of statistical inference, including sufficiency, estimation, testing, regression, analysis of variance, and chi-square tests. Prerequisite: MATH 414

STAT 416 (MATH) STOCHASTIC MODELING (3) Review of distribution models, probability generating functions, transforms, convolutions, Markov chains, equilibrium distributions, Poisson process, birth and death processes, estimation. Prerequisite: STAT 318 OR STAT 414; MATH 230

STAT 418 (MATH) PROBABILITY (3) Fundamentals and axioms, combinatorial probability, conditional probability and independence, probability laws, random variables, expectation; Chebyshev's inequality. Students may take only one course from STAT(MATH) 414 and 418 for credit. Prerequisite: MATH 230 or MATH 231

STAT 460 INTERMEDIATE APPLIED STATISTICS (3) Review of hypothesis testing, goodness-of-fit tests, regression, correlation analysis, completely randomized designs, randomized complete block designs, latin squares. Prerequisite: 3 credits in statistics

STAT 462 APPLIED REGRESSION ANALYSIS (3) Introduction to linear and multiple regression; correlation; choice of models, stepwise regression, nonlinear regression. Prerequisite: STAT 200, STAT 240, STAT 250, STAT 301,or STAT 401

STAT 464 APPLIED NONPARAMETRIC STATISTICS (3) Tests based on nominal and ordinal data for both related and independent samples. Chi-square tests, correlation. Prerequisite: STAT 200, STAT 240, STAT 250, STAT 301, or STAT 401

STAT 470W PROBLEM SOLVING AND COMMUNICATION IN APPLIED STATISTICS (3) Provide problem solving and communication skills through development of writing ability, interaction with peers and the SCC, and oral presentations. Prerequisite: STAT 460, STAT 462, STAT 480

STAT 480 INTRODUCTION TO STATISTICAL PROGRAM PACKAGES (1) Selection and evaluation of statistical computer packages. Prerequisite: 3 credits in statistics

STAT 496 INDEPENDENT STUDIES (1–18)
STAT 497 SPECIAL TOPICS (1–9)
STAT 499 (GI) FOREIGN STUDIES (1–12)

STATISTICS (STATS)

Capital College

STATS 320 ELEMENTARY STATISTICS (3) Descriptive statistics and data analysis, elementary probability, binomial and normal distributions, confidence intervals and hypothesis testing, linear regression and correlation. Prerequisite: college algebra

STRINGS, MUSIC (STRNG)

College of Arts and Architecture

See **www.psu.edu/bulletins/bluebook**, University Course Descriptions button.

SUPPLY CHAIN AND INFORMATION SYSTEMS (SC&IS)

Smeal College of Business

SC&IS 397 SPECIAL TOPICS (1–9)
SC&IS 398 SPECIAL TOPICS (1–9)
SC&IS 404 DEMAND FULFILLMENT (3) Analysis of demand fulfillment and the role of distribution operations management in the supply chain. Prerequisite: B A 302
SC&IS 405 MANUFACTURING AND SERVICES STRATEGIES (3) Investigates operations strategy and its relationship to other functions in the supply chain and presents quantitative tools for decision-making. Prerequisite: B A 302
SC&IS 406W STRATEGIC PROCUREMENT (3) Analysis of strategic procurement in the supply chain. Prerequisite: SC&IS 404 and SC&IS 405
SC&IS 421 SUPPLY CHAIN MODELING AND ANALYSIS (3) Problem solving and modeling methods for analyzing supply chains management. Prerequisite: SC&IS 404 and SC&IS 405 Concurrent: SC&IS 406W
SC&IS 423 INFORMATION TECHNOLOGY IN SUPPLY CHAINS (3) Appropriate and effective use of information technology in supply chain. Prerequisite: SC&IS 404 and SC&IS 405 Concurrent: SC&IS 406W
SC&IS 450 STRATEGIC DESIGN AND MANAGEMENT OF SUPPLY CHAINS (3) Strategic design and management of supply chains, with emphasis on managing inventory, capacity, and cross-firm/cross-functional relationships. Prerequisite: SC&IS 421 and SC&IS 423
SC&IS 494 RESEARCH PROJECT (1–12)
SC&IS 496 INDEPENDENT STUDIES (1–18)
SC&IS 497 SPECIAL TOPICS (1–9)
SC&IS 498 SPECIAL TOPICS (1–9)

SURVEYING (SUR)

College of Engineering

SUR 111 PLANE SURVEYING (3) Plane surveying principles; basic measurement statistics; use and care of equipment; traversing, area, and coordinate computations; differential leveling. Prerequisite: MATH 026 Concurrent: MATH 081
SUR 112 CURVE GEOMETRY (3) Geometric properties and design elements of horizontal and vertical alignment; earthwork and volume computations; field procedures. Prerequisite: MATH 081, SUR 111
SUR 162 METHODS IN LARGE SCALE MAPPING (3) CAD applications related to mapping sciences; data collection using traditional and satellite techniques; development of DTMs, contours, and map compilation. Prerequisite: SUR 111; ED&G 100 or EG T 102
SUR 211 CONSTRUCTION SURVEYING APPLICATIONS (2) Application of surveying principles in the field of construction: building layout, pipe/culvert, street, quantity, and as-built surveys. Prerequisite: SUR 112, SUR 162
SUR 222 PHOTOGRAMMETRY (3) Basic principles of metric photogrammetry with single and stereopair photos; coordinate transformations; map production with stereo imagery; flight planning. Lab. Prerequisite: SUR 162
SUR 241 SURVEYING MEASUREMENT ANALYSIS (3) Statistical error analysis of surveying measurements; propagation of random errors; confidence intervals and statistical testing. Lab. Prerequisite: SUR 111 Concurrent: MATH 083 or MATH 140
SUR 262 COORDINATE SYSTEMS IN MAP PROJECTIONS (2) Introduction to coordinate systems used in the Lambert, Mercator, Transverse Mercator, and UTM map projections; reduction of surveying observations. Prerequisite: SUR 162
SUR 272 CADASTRAL SURVEYING (3) Evolution of land records systems; PLS: property ownership and conveyancing; common and statute law; rules of construction; boundary location procedures. Prerequisite: SUR 111
SUR 296 INDEPENDENT STUDIES (1–18)
SUR 313 PRACTICAL FIELD PROBLEMS (3) Geodetic, topographic, astronomic, construction surveying; equipment adjustment; precise leveling; land subdivision; map construction; uses of GIS. Prerequisite: SUR 162, SUR 251

SUR 325 ADVANCED PHOTOGRAMMETRY (3) Advanced topics in metric photogrammetry; analytical techniques in photo- grammetry; applications in close-range photogrammetry; introduction to digital photogrammetry. Prerequisite: MATH 220 or MATH 230; SUR 222, SUR 341
SUR 341 ADJUSTMENT COMPUTATIONS (3) Matrix methods in least squares; random error propagation; observation equation model; conditions between parameters; basic post-adjustment statistical analysis. Prerequisite: CMPSC 201C, STAT 401, SUR 241
SUR 351 GEODETIC MODELS (3) Three dimensional geodesy; computations on the ellipsoid; map projections; reduction of observations and elements of physical geodesy. Prerequisite: SUR 241
SUR 362 MULTIPURPOSE LAND INFORMATION SYSTEMS (3) Basic concepts in geographic information systems; spatial reference frame- works; map and text data; digital environments; software and hardware platforms. Prerequisite: SUR 222, SUR 241, SUR 272
SUR 372W LEGAL ASPECTS OF LAND SURVEYING (3) Legal research; rules of evidence including classification and evaluation; unwritten rights; land description composition; easements. Prerequisite: SUR 272
SUR 375 LAND USE CONTROLS (2) Historical overview of private restrictions and public regulation of land use; the planning process; local zoning ordinances and subdivision regulations. Prerequisite: SUR 272
SUR 385 ENGINEERING LAND SURVEYS (3) Storm water management, methodologies, design, and regulatory requirements; soil erosion and sedimentation control, technical requirements, control plan, permits and compliance. Prerequisite: C E 360 or CE T 261, SUR 112, SUR 162
SUR 441 DATA ANALYSIS AND PROJECT DESIGN (3) Post least squares adjustment analysis of control networks, statistical testing, blunder detection, network design considerations, and computer optimization techniques. Prerequisite: STAT 401 or STAT 451, SUR 341
SUR 445 NUMERICAL METHODS IN ADJUSTMENT COMPUTATIONS (3) Computer optimization techniques used in adjustment of large, sparse, positive-definite matrices with emphasis on efficient storage and solution routines. Lab. Prerequisite: SUR 341
SUR 455 PRECISE POSITIONING SYSTEMS (3) Stellar coordinate systems; geodetic reference coordinate systems; satellite orbital theory; global positioning systems; pseudo-ranging; GPS vector adjustments. Prerequisite: SUR 351. Prerequisite or concurrent: SUR 441
SUR 465 MULTIPURPOSE LAND INFORMATION SYSTEMS APPLICATIONS (3) Using a GIS as a decision tool; spatial modeling; data structure and management issues; legal issues; case studies; application projects. Prerequisite: SUR 362
SUR 471 PROFESSIONAL ASPECTS OF LAND SURVEYING (3) Ethical issues and legal limits of practice; surveyor as an expert witness; surveyor-client relationship; responsibilities to the profession. Prerequisite: SUR 372W
SUR 482 LAND DEVELOPMENT DESIGN (3) The land development process; geometric, environmental, aesthetic aspects of development; local regulatory requirements; preparation of final plat and report. Prerequisite: SUR 313, SUR 471
SUR 485 INTRODUCTION TO STORMWATER MANAGEMENT DESIGN (3) Fluid statics, continuity, energy, friction, rainfall, abstractions, travel time, runoff, municipal regulations, storm sewer design, stormwater management design. Prerequisite: MATH 141, PHYS 211, sixth-semester standing
SUR 490 SEMINAR IN SURVEYING (1) Individual or group work in surveying. Prerequisite: SENIOR STANDING
SUR 496 INDEPENDENT STUDIES (1–18)
SUR 497 SPECIAL TOPICS (1–9)

SWAHILI (SWA)

College of the Liberal Arts

SWA 001 ELEMENTARY SWAHILI I (4) Listening, speaking, reading, writing Swahili: an introduction for beginners; basic structures and vocabulary; cultural elements.
SWA 002 ELEMENTARY SWAHILI II (4) Listening, speaking, reading, and writing Swahili; structures and vocabulary; cultural elements. Prerequisite: SWA 001
SWA 003 INTERMEDIATE SWAHILI (4) Further development of listening, speaking, reading, and writing skills in Swahili: structures and vocabulary; cultural elements. Prerequisite: SWA 002
SWA 097, 197, 297, 397 SPECIAL TOPICS (1–9)
SWA 099, 199, 299, 399, 499 (GI) FOREIGN STUDIES (1–12)
SWA 294, 494 RESEARCH PROJECT (1–12)
SWA 295, 395 INTERNSHIP (1–18)
SWA 296, 496 INDEPENDENT STUDIES (1–18)
SWA 498 SPECIAL TOPICS (1–9)

TELECOMMUNICATIONS (TELCM)

TELCM 140 INTRODUCTION TO TELECOMMUNICATIONS SYSTEMS (2) Elements of telecommunications systems, including telephones, transmission lines, switching, digital data, and transmission by microwave, satellite, and fiber optics.
TELCM 197 SPECIAL TOPICS (1–9)
TELCM 241 SWITCHING AND TRAFFIC (3) Routing of telecommunications messages: characteristics, methods, and control. Prerequisite: TELCM 140

TELCM 241W TELECOMMUNICATIONS SWITCHING AND DATA (3) An advanced discussion of switching principles present in today's telephone and data systems environment; traffic theory for telephone and data systems is included. Prerequisite: ENGL 015, TELCM 140 Concurrent: TELCM 244
TELCM 242 INTRODUCTION TO TELECOMMUNICATIONS LABORATORY (1) Techniques used for measurements of basic telecommunications circuits and equipment. Prerequisite: or concurrent: TELCM 241
TELCM 243 TRANSMISSION (3) Transmission of telecommunications information, including design problems. Prerequisite: TELCM 140
TELCM 244 ADVANCED TELECOMMUNICATIONS LABORATORY (1) Testing and measurement of advanced telecommunication transmission and switching equipment, including practical alignment and testing of operational systems. Prerequisite: or concurrent: TELCM 243
TELCM 296 INDEPENDENT STUDIES (1–18)
TELCM 297, 298 SPECIAL TOPICS (1–9)
TELCM 298 SPECIAL TOPICS (1–9)

THEATRE (THTRE)

Capital College
THTRE 446 (COMMS) PERFORMANCE STUDIES (3) Study of and experimentation with a selected concept of theatre, such as children's theatre, foreign language plays, or presentational theatre. Prerequisite: COMMS 251
THTRE 497 SPECIAL TOPICS (1–9)

THEATRE (THEA)

College of Arts and Architecture
THEA 001 FRESHMAN SEMINAR: ISSUES IN ACADEMIC AND PROFESSIONAL THEATRE (1) An orientation to the Theatre Arts Department, curriculum, and profession; for all new theatre arts majors. Prerequisite: admission into Theatre Arts Program
THEA 100 (GA) THE ART OF THE THEATRE (3) An experiential survey of all aspects of the living theatre, as presented by a resident company of theatre artists.
THEA 101S THE THEATRICAL IMAGINATION (3) An exploration of the creative processes and skills necessary for theatrical expression. Team taught by technical/design and performance faculty members. Theatre majors only. Prerequisite: or concurrent: THEA 100
THEA 102 (GA) FUNDAMENTALS OF ACTING (3) Introduction to the art and craft of acting for non-Theatre majors.
THEA 103 FUNDAMENTALS OF DIRECTING (3) Training and experience in basic skills of directing. Designed for non- theatre majors.
THEA 104 FUNDAMENTALS OF THEATRE PRODUCTION (3) Training and experience in basic skills of technical theatre. Designed for non-theatre majors.
THEA 105 (GA) INTRODUCTION TO THEATRE (3) An introduction and overview of the history, craft, and art of the theatre to foster an informed appreciation of theatrical events. This course is an alternate to THEA 100.
THEA 110 PLAYSCRIPT ANALYSIS (3) Theory and method of playscript analysis for the general theatre student.
THEA 112 INTRODUCTION TO MUSIC THEATRE (3) A survey of music theatre as an art form.
THEA 113 MUSICAL THEATRE THEORY I (3) Studies in the fundamentals of music notation and sight-singing. Prerequisite: admission into Musical Theatre Option
THEA 114 MUSIC THEATRE: FORM AND ANALYSIS (3) A survey of music theatre as an art form. Prerequisite: admission into Musical Theatre Option
THEA 120 ACTING I (3) Fundamental skills and training in acting. Emphasis on physical/vocal awareness and the nature of dramatic communication. Theatre majors only. Prerequisite: THEA 101S
THEA 146 BASIC THEATRICAL MAKEUP (2) Both straight and corrective makeup, with character and styling techniques for stage, film, and television.
THEA 150 FUNDAMENTALS OF DESIGN FOR THE THEATRE (3) Exploration of the philosophy and technique of scenic, costume, and lighting design. Prerequisite: THEA 101S
THEA 160 INTRODUCTION TO COSTUME CRAFTS (3) Process of costuming combined with laboratory projects. Crew experience on major productions. Prerequisite: THEA 150
THEA 170 INTRODUCTION TO STAGE LIGHTING PRODUCTION TECHNIQUES (3) Introduction to theatre lighting facilities, equipment, and practice. Practical experience with major productions. Prerequisite: THEA 150
THEA 180 INTRODUCTION TO STAGECRAFT (3) Introduction to methods, materials, equipment, facilities, and concepts used in scenery construction for the Theatre. Practical experience with departmental productions. Prerequisite: THEA 150
THEA 189 (GA) THEATRE PRODUCTION PRACTICUM (1 per semester, maximum of 6) Supervised experience in theatre by crew participation in University theatre productions. For non-theatre students only.
THEA 198 SPECIAL TOPICS (1–9 per semester)
THEA 199 (GI) FOREIGN STUDIES—THEATRE ARTS (1–12) Courses offered in foreign countries by individual or group instruction. Prerequisite: approval by department

THEA 207 (GA;GI) GENDER AND THEATRE (3) A study of theatre and drama literature as formed by issues of gender, race, and ethnic background.
THEA 208 (GA;GI) (AAA S) WORKSHOP: THEATRE IN DIVERSE CULTURES (3) A performance-oriented class which explores the historic and contemporary theatrical works of various culturally diverse peoples.
THEA 208S (GA;GI) WORKSHOP: THEATRE IN DIVERSE CULTURES (3) A performance-oriented class which explores the historic and contemporary theatrical works of various culturally diverse peoples (Berks-Lehigh Valley).
THEA 210 INTRODUCTION TO CREATIVE DRAMATICS (3) Introduction and direct experience in creative dramatics and survey of children's theatre.
THEA 212 MUSICAL THEATRE THEORY II (3) Intermediate studies in diatonic harmony, analysis, sight-singing and dictation. Prerequisite: THEA 113, THEA 114, and admission into Musical Theatre Option
THEA 214 MUSICAL THEATRE THEORY III (3) Advanced studies in the technique and practice of chromatic harmonic analysis and sight-singing. Prerequisite: THEA 113, THEA 114, THEA 212
THEA 220 ACTING II (3) Principles of acting through improvisation, exercises, and character analysis, with emphasis on basic skills of voice and movement. For theatre majors only. Prerequisite: THEA 120
THEA 221 ACTING III (3) A continuation of Thea. 220. For Theatre majors only. Prerequisite: THEA 160, THEA 170, or THEA 180; THEA 220, approval by department
THEA 222 (THEA) ACTING LABORATORY (2) Laboratory experience in student-directed scenes and/or one-act plays. Prerequisite: THEA 120
THEA 223 MUSIC THEATRE PERFORMANCE I (3) Studio training in the unique performance skills, repertory, and business of professional music theatre. Prerequisite: THEA 114, THEA 120, THEA 212, admission into Musical Theatre Option
THEA 224 MUSIC THEATRE PERFORMANCE II (3) Studio training in the unique performance skills, repertory, and business of professional music theatre. Prerequisite: THEA 223, admission into Musical Theatre Option
THEA 251 THEATRE DRAFTING TECHNIQUES (2) Introduction to drafting of floor plans, section drawings, construction graphics, and mechanical perspective for the theatre.
THEA 252 DESIGN PRESENTATION TECHNIQUES (1) Media and materials exploration; sketching, rendering, and modeling methods.
THEA 253 SCENE PAINTING (1) Introduction to painting scenery for the theatre; methods and materials.
THEA 260 COSTUME DESIGN I (3) Introduction to costume design; developing skills and characterization through color, line, and texture. Prerequisite: THEA 160
THEA 270 STAGE LIGHTING DESIGN I (3) Introduction to stage lighting, physical and design concepts, and capabilities. Crew experience with a major production. Prerequisite: THEA 170
THEA 282 (GA) PRODUCTION PRACTICUM (3–6) Introduction to all aspects of theatre production—analysis, design, construction, production, performance—for non-theatre majors.
THEA 289 THEATRE PRODUCTION PRACTICUM (1 per semester, maximum of 3) Supervised experience in production techniques.
THEA 296 INDEPENDENT STUDIES (1–18)
THEA 297, 298 SPECIAL TOPICS (1–9)
THEA 320 SCENE STUDY I (3) Advanced monologue and scene study techniques. Principal focus on realism. Prerequisite: THEA 221 AND APPROVAL BY THE DEPARTMENT
THEA 321 SCENE STUDY II (3) A continuation of THEA 320. Prerequisite: THEA 320 AND APPROVAL BY DEPARTMENT
THEA 322 VOICE AND SPEECH I (2) Vocal techniques for the actor: articulation, voice control, support, and projection. Prerequisite: THEA 120
THEA 323 VOICE AND SPEECH II (2) A continuation of THEA 322. Prerequisite: THEA 322
THEA 324 MOVEMENT FOR ACTORS I (2) Techniques and skills in physical expression, awareness, control, and stage movement. Prerequisite: THEA 120
THEA 325 MOVEMENT FOR ACTORS II (2) Continuation of THEA 324. Prerequisite: THEA 324
THEA 326 MUSIC THEATRE PERFORMANCE WORKSHOP (1 per semester, maximum of 3) Performance studies in cabaret, revue, and club environments. Prerequisite: DANCE 234, THEA 224, enrollment in Musical Theatre Option
THEA 327 MUSICAL THEATRE AUDITIONS (2) Research and preparation of auditions for work in professional musical theatre venues. Prerequisite: THEA 224
THEA 350 SCENE DESIGN I (3) Demonstrations, lectures, and practical work in the design of scenery for the theatre. Prerequisite: THEA 150, THEA 251, THEA 252
THEA 361 COSTUME CONSTRUCTION I (3) Costume production techniques through flat patterning and draping methods; adaptation of methods to period costume. Prerequisite: THEA 160
THEA 370 (COMM) CREATIVE LIGHTING TECHNIQUES FOR MEDIA PRODUCTION (3) An exploration of lighting design techniques for electronic and film media. Prerequisite: COMM 150, THEA 270
THEA 380 TECHNICAL PRODUCTION I (3) Comprehensive survey of scenic construction and theatrical rigging. Special attention given to contemporary professional stagecraft techniques. Prerequisite: THEA 180
THEA 381 TECHNICAL PRODUCTION II (3) Comprehensive survey of scenic construction and theatrical rigging. Continuation of THEA 380. Prerequisite: THEA 380

THEA 398 SPECIAL TOPICS (1–9 per semester)
THEA 400 ADVANCED THEATRE PROJECTS (1–6 per semester) Individual and group-directed study of in-depth projects involving reading, discussion, performance, and critical analysis by faculty. Prerequisite: seventh-semester standing or 12 credits in theatre or related areas
THEA 401W THEATRE HISTORY I: ANCIENT TO 1700 (3) Survey of drama and theatre from primitive rites through the Renaissance. Prerequisite: THEA 100
THEA 402W THEATRE HISTORY II: FROM 1700 TO PRESENT (3) Survey of European drama and theatre from the eighteenth century through the modern period. Prerequisite: THEA 100
THEA 405 THEATRE HISTORY: AMERICAN THEATRE (3) Survey of American drama and theatre from the colonial period to the present. Prerequisite: THEA 100
THEA 406 THEATRE IN ASIA (3) A survey of major theatre forms and traditions in Asia. Prerequisite: THEA 100
THEA 407 (GI) (WMNST) WOMEN AND THEATRE (3) A study of theatre practice and dramatic literature as informed by issues of gender, race, and ethnic background. Prerequisite: THEA 100
THEA 408 HISTORY OF AMERICAN MUSICAL THEATRE (3) A survey of the history of American musical theatre presented in a social, cultural, and aesthetic prospective. Prerequisite: THEA 100
THEA 410 PLAY ANALYSIS (3) Advanced skills in textual analysis of plays and screenplays. Prerequisite: THEA 100
THEA 412 (GI) (AAA S) AFRICAN AMERICAN THEATRE (3) Exploration of the development of African American theatre from its roots in Africa through the diaspora, to the present time. Prerequisite: THEA 100
THEA 423 MUSIC THEATRE PERFORMANCE III (3) Studio training in the unique performance skills, repertory, and business of professional music theatre. Prerequisite: THEA 224, seventh-semester standing in the Musical Theatre Option
THEA 424 MUSIC THEATRE PERFORMANCE IV (3) Studio training in the unique performance skills, repertory, and business of professional music theatre. Prerequisite: THEA 423
THEA 426 CHILDREN'S THEATRE (3) Theories and practice of theatre for children. Prerequisite: THEA 150, THEA 220
THEA 428 CREATIVE DRAMA (3) Exercises and techniques for creative growth of children and adults, creative interaction for classroom, recreational, social, or therapeutic environments. Prerequisite: fifth-semester standing
THEA 429 THEATRE PERFORMANCE PRACTICUM (1–3 per semester) Supervised experience in rehearsal and performance of significant roles. Prerequisite: admission by audition only
THEA 434 INTRODUCTION TO DIRECTING (3) Introduction to principles and procedures of play direction. Prerequisite: THEA 114 or THEA 410; THEA 160, THEA 170, or THEA 180
THEA 436 DIRECTORIAL PROCESSES (3) Preparing a play for production including the scoring of thescript, developing ground plan, casting, and staging projects in American realism. Prerequisite: THEA 434 and approval of the instructor of proposed project prior to registration
THEA 437 ARTISTIC STAFF FOR PRODUCTION (1–6) To provide students with experience in choreography, dramaturgy, combat, staging, voice/speech, musical direction, assisting in direction, for major productions. Prerequisite: approval of the instructor of proposed project prior to registration
THEA 439 PROJECTS IN DIRECTING (1) Projects in directing for analysis and critique. Prerequisite: THEA 436 and approval of the instructor of proposed project prior to registration
THEA 440 PRINCIPLES OF PLAYWRITING (3) Structure, dramatic effect, characterization, and dialogue; the writing, reading, and criticism of original one-act plays. Prerequisite: THEA 100
THEA 447 MAKE-UP DESIGN FOR PRODUCTION (1–6) Materials, research, preparation, design, execution of make-up for major University Theatre productions. Prerequisite: approval of the instructor of proposed project prior to registration
THEA 450 SCENIC DESIGN II (3 per semester, maximum of 6) Design emphasis on production techniques: sketches, rendering, drafting, elevations, and stage mechanics. Prerequisite: THEA 350 or portfolio review
THEA 451 DRAFTING, DRAWING, AND PAINTING FOR THE THEATRE (1) Drafting, freehand drawing including perspective methods and property development, rendering techniques, and painters' elevations. Prerequisite: THEA 251, THEA 252 and prior approval of the instructor; first-year MFA Theatre candidacy
THEA 452 ADVANCED PRESENTATION TECHNIQUES (1) Advanced drafting, freehand drawing, rendering techniques, model building, and reproduction techniques. Prerequisite: THEA 451
THEA 453 ADVANCED SCENE PAINTING (1–3 per semester, maximum of 12) Practicum study in painting techniques currently in professional use. Exploration of tools, available paints, and texturing materials. Prerequisite: THEA 253
THEA 454 PERIOD RESEARCH FOR THE THEATRE (3) History of decor, styles, and movements in art and architecture. Prerequisite: BFA Theatre candidacy or permission of instructor
THEA 455 TWENTIETH-CENTURY DESIGN (3) Seminar study of movements, practices, methods, and designers in the modern theatre. Prerequisite: BFA Theatre candidacy and prior approval of faculty
THEA 456 SCENIC PROJECTS FOR PRODUCTION (1 per semester, maximum of 6) Special projects for production; painting, properties, design assistance. Prerequisite: approval of proposed projects by instructor prior to registration
THEA 457 SCENE DESIGN FOR PRODUCTION (1 per semester, maximum of 6) Design and execution of production projects. Prerequisite: approval of proposed project by instructor prior to registration

THEA 459 PORTFOLIO PRESENTATION (1) Current practice in portfolio development and presentation to client and employer. Prerequisite: BFA Theatre candidacy and permission to enroll
THEA 460 COSTUME DESIGN II (3) Advanced costume design, with emphasis on the total production. Prerequisite: THEA 260, THEA 464
THEA 461 COSTUME CONSTRUCTION II (3) Advanced costume construction, with emphasis on corsetry, tailoring, pattern development for period clothing. Prerequisite: THEA 361
THEA 464 HISTORY OF FASHION (3) Survey of dress from Egyptian period to contemporary fashion. Prerequisite: THEA 100
THEA 465 HISTORY OF FASHION II (3) Survey of dress from 1800 to contemporary fashion. Prerequisite: THEA 100 or THEA 105
THEA 466 COSTUME CONSTRUCTION FOR PRODUCTION (1 per semester, maximum of 6) Execution of production projects in construction and shop management. Prerequisite: approval of proposed project by instructor prior to registration
THEA 467 COSTUME DESIGN FOR PRODUCTION (1 per semester, maximum of 6) Design and execution of production design projects. Prerequisite: approval of proposed project by instructor prior to registration
THEA 470 STAGELIGHTING II (3) Introduction to lighting capabilities in arena thrust and proscenium venues. Prerequisite: THEA 270
THEA 471 STAGELIGHTING DESIGN II (3) Advanced training through lectures and laboratory experience with color, shape, and form as it relates to the specifics of illumination. Prerequisite: THEA 470
THEA 473 THE HISTORY OF STAGE LIGHTING TECHNOLOGY (3) An exploration of the history of stage lighting from the development of electric light to the present. Prerequisite: THEA 270
THEA 475 CREATIVE LIGHTING IN THE ENTERTAINMENT ARTS (3) Survey/analysis of the growth of creative lighting in venues other than theatre; advances in design for the entertainment world. Prerequisite: THEA 270 AND CONSENT OF INSTRUCTOR
THEA 477 LIGHTING DESIGN FOR PRODUCTION (1 per semester, maximum of 6) Design and execution of design projects. Prerequisite: approval of proposed project by instructor prior to registration
THEA 480A TECHNICAL PRODUCTION III (3) Technical draftings; focus on the creation of packages of drawings based on designer elevations from actual productions; drafting intensive. Prerequisite: THEA 150, THEA 251, THEA 381
THEA 480B TECHNICAL PRODUCTION IV (3) Discussion of problems of the technical director: personnel management, time management, scheduling, budgeting, purchasing, and the technical drawing of production. Prerequisite: THEA 381
THEA 481 STAGE AND PRODUCTION MANAGEMENT (3) Production planning, scheduling, assignment of personnel, rehearsal procedures, and budgeting. Prerequisite: THEA 170, THEA 180
THEA 483A TECHNICAL PRODUCTION V (3) Calculation for, and specification of advanced wood structures and rigging for theatrical production. Prerequisite: THEA 480A
THEA 483B TECHNICAL PRODUCTION VI (3) Tool maintenance necessary in the scene shop and the procedures, tracking, and repair information necessary for the technical director. Prerequisite: THEA 480B
THEA 485 SOUND FOR THEATRE PRODUCTION (3) Aesthetics of live and recorded sound; recording and editing techniques for the stage. Prerequisite: THEA 100, THEA 150
THEA 486 STAGE MANAGEMENT FOR PRODUCTION (1–9) Stage manager for University Theatre production. Prerequisite: approval of proposed assignment by instructor prior to registration
THEA 487 TECHNICAL PROJECTS FOR PRODUCTION (1 per semester, maximum of 6) Execution of practical production projects. Prerequisite: approval of proposed project by instructor prior to registration
THEA 489 THEATRE PRODUCTION PRACTICUM (1 per semester) Supervised experience in production techniques. For theatre majors only. Prerequisite: THEA 160, THEA 170, or THEA 180
THEA 495 INTERNSHIP PRACTICUM (1–6 per semester, maximum of 12) Professional field experience in theatre performance, production, and management assignments. Prerequisite: approval of internship by instructor prior to registration
THEA 496 INDEPENDENT STUDIES (1–18)
THEA 497, 498 SPECIAL TOPICS (1–9)
THEA 499 (GI) FOREIGN STUDIES—THEATRE ARTS (1–12) Courses offered in foreign countries by individual or group instruction. Prerequisite: approval by department

TRAINING AND DEVELOPMENT (TRDEV)

College of Education

TRDEV 418 INSTRUCTIONAL METHODS IN TRAINING AND DEVELOPMENT (3) Emphasis on teaching techniques and learning principles used by trainers and supervisors in business, health care, and government.
TRDEV 421 PRESENTATION SKILLS FOR NEW TRAINERS (3) The effective use of platform skills for training, including the use of voice, audio-visual aids, group facilitation, and personal presence. Prerequisite: admission to M.Ed. program in training and development
TRDEV 431 BASIC TECHNOLOGY SKILLS IN TRAINING (3) Introduces basic training technology skills: electronic communications, word processing, spreadsheets, databases; provides skills to create and maintain electronic presentations and programs. Prerequisite: admission to the training and development program, training and development certificate program, or permission of the program

TRDEV 432 VIDEO PRODUCTION IN TRAINING (3) Introduces learners to the equipment, design, and production of video instruction for the workplace. Prerequisite: TRDEV 418, TRDEV 431, or permission of program
TRDEV 460 FOUNDATIONS IN TRAINING AND DEVELOPMENT (3) Roles in training and development, relationships between training and development and other organizational structures, and the principles of training design.
TRDEV 497 SPECIAL TOPICS (1–9)

TURFGRASS (TURF)

College of Agricultural Sciences
TURF 100 INTRODUCTION TO TURFGRASS MANAGEMENT (3) Introduction to turfgrass species, establishment, maintenance, and pest control of turfgrass species used for sports, lawn/utility turf, and golf courses.
TURF 230 TURFGRASS PESTICIDES (1) Course covers chemical toxicity, formulations, environmental fate, labels, MSDS, calibration, IPM, safety, handling, storage, and Pennsylvania certification and regulations.
TURF 235 THE TURFGRASS (3) Characterization of the primary plant species used for sports, lawn and utility turf; includes turfgrass morphology, environmental adaptation, and cultural requirements.
TURF 236 TURFGRASS PEST MANAGEMENT (3) A study of the cultural and chemical management of turfgrass pests with emphasis on integrated management systems. Prerequisite: CHEM 012, CHEM 013, TURF 235
TURF 238 (HORT) TURF AND ORNAMENTAL WEED CONTROL (3) Students will be introduced to the development of integrated weed management strategies utilizing a variety of cultural and chemical methods. Prerequisite: CHEM 012
TURF 297 SPECIAL TOPICS (1–9)
TURF 425 TURFGRASS CULTURAL SYSTEMS (3) A study of turfgrass maintenance practices and how their interrelationships can be utilized to develop meanagement systems. Prerequisite: SOILS 101, TURF 235
TURF 434 TURFGRASS EDAPHOLOGY (3) Characterization of soil physical and chemical properties for the establishment and maintenance of sports turf; includes root-zone construction. Prerequisite: SOILS 101, TURF 235
TURF 436W TURFGRASS MANAGEMENT SYSTEMS (3) Case study and discussion considering integrated management of selected turfgrass sites; emphasis on problem analysis, principle application, and decision making. Prerequisite: TURF 235, TURF 236, TURF 425
TURF 489 SUPERVISED EXPERIENCE IN COLLEGE TEACHING (1–3 per semester) Participate with instructors in teaching and undergraduate turfgrass course. Assist with teaching an evaluation and with development of instructional materials. Prerequisite: TURF 235
TURF 490 COLLOQUIUM (1) Oral presentations developed by students in consultation with the course instructor. Prerequisite: seventh semester standing
TURF 495 INTERNSHIP (1–18)
TURF 496 INDEPENDENT STUDIES (1–18)

UKRAINIAN (UKR)

College of the Liberal Arts
UKR 001 ELEMENTARY UKRAINIAN I (4) Reading, writing, and speaking Ukrainian.
UKR 002 ELEMENTARY UKRAINIAN II (4) Reading, writing, and speaking Ukrainian. Prerequisite: UKR 001
UKR 003 INTERMEDIATE UKRAINIAN (4) Reading, writing, and speaking Ukrainian. Prerequisite: UKR 002
UKR 099, 199, 299, 399, 499 (GI) FOREIGN STUDIES (1–12)
UKR 100 (GH;GI) UKRAINIAN CULTURE AND CIVILIZATION (3) Survey of Ukrainian culture and civilization from the Middle Ages to the present.
UKR 196 INDEPENDENT STUDIES (1–18)
UKR 197 SPECIAL TOPICS (1–9)
UKR 204 READINGS IN UKRAINIAN (3) Readings in Ukrainian literature and journalism. Prerequisite: UKR 003
UKR 294, 494 RESEARCH PROJECT (1–12)
UKR 395 INTERNSHIP (1–18)

URBAN EARLY AND MIDDLE CHILDHOOD EDUCATION (URBED)

Commonwealth College; College of Education
URBED 296 INDEPENDENT STUDIES (1–18)
URBED 297 SPECIAL TOPICS (1–9)
URBED 395W FIELD EXPERIENCE FOR URBAN TEACHER PREPARATION (2 per semester, maximum of 6) Structured opportunities for investigating and understanding the work of teachers within urban schools and communities. Prerequisite: C I 295, EDPSY 014, EDTHP 115 Concurrent: SPLED 444, URBED 400, URBED 401, or URBED 402

URBED 400 URBAN SCHOOLS AND FAMILY AND COMMUNITY SYSTEMS (5) Cultural and ethnic dimensions of family-school-community communications and the resultant impact on student-teacher relations. Prerequisite: C I 295, EDPSY 014, EDTHP 115, 6 credits of social/behavioral sciences Concurrent: EDTHP 411, EDTHP 416, URBED 395W

URBED 401 USING LITERACY AND COMMUNICATION (SOCIAL) KNOWLEDGE AND ASSESSMENT IN URBANENV IRONMENTS (10) Knowledge and skills pertaining to the development of social knowledge and communication effectiveness within urban schools and communities; assessment. Prerequisite: URBED 400 Concurrent: URBED 395W

URBED 402 EARLY TO MIDDLE CHILDHOOD TEACHING AND ASSESSMENT FOR URBAN SETTINGS (7) Urban early to middle childhood education: pluralistic pedagogical foundations, assessment, child's play, instructional activities, State/Federal initiatives, and parent programs. Prerequisite: A ED 303, MUSIC 241, URBED 400 Concurrent: URBED 395W

URBED 403 USING SCIENCE AND MATHEMATICS KNOWLEDGE AND ASSESSMENT IN URBAN SETTINGS (6) Knowledge, skills, and assessment pertaining to science and mathematics education in urban schools. Prerequisite: CMPSC 101, MATH 200, URBED 400, and 9 credits of natural sciences Concurrent: URBED 395W

URBED 496 INDEPENDENT STUDIES (1–18)

URBED 497 SPECIAL TOPICS (1–9)

VETERINARY SCIENCE (V SC)

College of Agricultural Sciences

V SC 050S MECHANISMS OF DISEASE (3) Introduction to the study of disease pathogenesis and careers in Animal Health Research and Service.

V SC 097 SPECIAL TOPICS (1–9)

V SC 211 (GN) THE IMMUNE SYSTEM AND DISEASE (3) Introduction to the immune system that emphasizes the immune response to infection and consequences of a defective immune response.

V SC 280 CURRENT ISSUES IN VETERINARY MEDICINE (1) Discussion of the social, ethical and economic aspects of current and emerging issues related to animal ownership and veterinary medicine.

V SC 297 SPECIAL TOPICS (1–9)

V SC 303 PRINCIPLES OF ANIMAL DISEASE (3) Principles involved in the causes of animal diseases; control measures, including sanitation and hygiene. Prerequisite: MICRB 106 or MICRB 201. Prerequisite or concurrent: AN SC 301

V SC 395 INTERNSHIP (1–10) Independent study and supervised field experience related to the student's professional interest. Limited to students in animal agriculture majors. Prerequisite: fifth-semester standing in an animal agriculture major; approval by department of proposed plan before registration

V SC 402 (ENT) BIOLOGY OF ANIMAL PARASITES (3) An introduction to animal parasitology. Emphasizes principles, economic importance, host/parasite interactions, epizootiology, zoonoses, control, and taxonomy. Prerequisite: BIOL 110

V SC 405 LABORATORY ANIMAL SCIENCE (3) Principles involved in maintaining laboratory animals. Emphasis is on management, preventive medicine, and surgical considerations used in laboratory animal colonies. Prerequisite: AN SC 001, AN SC 301, BIOL 110

V SC 407 DAIRY HERD HEALTH PROGRAMS (2) A discussion of health programs for dairy herds to assist in the control of infectious and metabolic diseases of dairy animals. Prerequisite: AN SC 301, AN SC 310, AN SC 427, AN SC 431W

V SC 420 GENERAL ANIMAL PATHOLOGY (3) Nature and mechanisms of the disease process including degenerations, growth disturbances, inflammation, host-parasite relationships and neoplasia. Prerequisite: AN SC 423 or BIOL 472, MICRB 201, AN SC 301

V SC 425 (AN SC) PRINCIPLES OF AVIAN DISEASES (3) Principles of pathogenesis and control of diseases in poultry and other avian populations. Case material used where appropriate. Prerequisite: AN SC 001, BIOL 110, MICRB 201

V SC 428W PATHOPHYSIOLOGY OF LACTATION (3) Overview of mastitis pathogenesis and control in dairy cattle; emphasis on solving practical problems through understanding critical host-pathogen interactions. Prerequisite: V SC 303

V SC 430 PRINCIPLES OF TOXICOLOGY (3) Introduction to the biomedical aspects of toxicology with emphasis on the mechanisms and fate of chemical interaction with biological systems. Prerequisite: BIOL 110, BIOL 240W; B M B 211 or B M B 401

V SC 432 (B M B;MICRB) ADVANCED IMMUNOLOGY: SIGNALING IN THE IMMUNE SYSTEM (3) The study of signaling pathways that regulate the immune response. Prerequisite: B M B 400, MICRB 410

V SC 433 (B M B) MOLECULAR AND CELLULAR TOXICOLOGY (3) In-depth coverage of processes by which drugs/chemicals interact with biological systems and the experimental approaches used to study these interactions. Prerequisite: B M B 401

V SC 435 (B M B;MICRB) VIRAL PATHOGENSIS (2) A study of the molecular, immunological, and pathological aspects of viral diseases as well as laboratory methods of diagnosis. Prerequisite: MICRB 201; B M B 251 and B M B 252 or BIOL 110 and BIOL 230W

V SC 489 (BIOTC) ANIMAL CELL CULTURE METHODS (3) AN OVERVIEW OF ANIMAL CELL CULTURE METHODOLOGY, AND ITS PRACTICAL APPLICATION IN BIOPROCESS TECHNOLOGY. Prerequisite: MICRB 201, MICRB 202; BIOL 230W OR B M B 251

V SC 496 INDEPENDENT STUDIES (1–18)
V SC 497 SPECIAL TOPICS (1–9)

VOICE, MUSIC (VOICE)

College of Arts and Architecture
See **www.psu.edu/bulletins/bluebook**, University Course Descriptions button.

WILDLIFE (WILDL)

College of Agricultural Sciences; Commonwealth College. These courses are offered only at Pnn State DuBois as part of the two-year Wildlife Technology major.
WILDL 101 INTRODUCTION TO WILDLIFE MANAGEMENT (3) Basic principles of wildlife management. Introduction to general ecology and wildlife population dynamics.
WILDL 103 ANIMAL IDENTIFICATION (3) Identification of mammals, birds, reptiles, and amphibians; introduction to their life histories.
WILDL 106 WILDLIFE MANAGEMENT TECHNIQUES (4) Overview of laboratory and field techniques for natural resource research and management; scientific writing and computer applications emphasized. Prerequisite: WILDL 101
WILDL 204 WILDLIFE MENSURATION (4) Estimation and analysis of animal populations and their habitats, including sampling considerations and basic biometry. Prerequisite: 3 credits in mathematics
WILDL 207 OUTDOOR RECREATION (3) Sociology, history, and economics of recreational demand; recreational areas and management procedures.
WILDL 208W TERRESTRIAL WILDLIFE MANAGEMENT (3) Ecological characteristics and manipulation of terrestrial habitats; control of wildlife populations. Prerequisite: FOR 240, FOR 250, WILDL 101, WILDL 103, WILDL 106, WILDL 204
WILDL 209 ANIMAL HANDLING AND CARE (4) Techniques in capturing, marking, and maintaining wild animals in captivity. Wildlife physiology, parasitology, and necropsy procedures are covered. Prerequisite: WILDL 101
WILDL 211 AERIAL PHOTO INTERPRETATION (4) Techniques of photo interpretation; type mapping of wildlife environments; photo censusing of wild animals.
WILDL 213 WETLANDS AND FISHERIES MANAGEMENT (3) Introduction to basic limnology. Ecology and management of swamp, marsh, pond, and stream habitats and their animal populations. Prerequisite: WILDL 101, WILDL 103, WILDL 106, WILDL 204
WILDL 295 INTERNSHIP IN WILDLIFE TECHNOLOGY (1–6) Supervised off-campus field experience related to student's major. Prerequisite: prior approval of proposed assignment by instructor.
WILDL 296 INDEPENDENT STUDIES (1–18)
WILDL 297 SPECIAL TOPICS (1–9)

WILDLIFE AND FISHERIES SCIENCE (W F S)

College of Agricultural Sciences
W F S 209 WILDLIFE AND FISHERIES CONSERVATION (3) Survey of current and historical issues in wildlife and fisheries conservation; emphasis on vertebrate biodiversity, habitat management and protection, and populations. Prerequisite: BIOL 110 or BIOL 240W
W F S 296 INDEPENDENT STUDIES (1–18)
W F S 300 THE VERTEBRATES (2) Overview of the evolution, systematics, ecology, and behavior of the subphylum vertebrata. Prerequisite: BIOL 110
W F S 301 VERTEBRATE LABORATORY (2) Overview of the anatomy, identification, collection, and preservation of the vertebrates. Prerequisite: or concurrent: W F S 209; W F S 300
W F S 310 WILDLIFE AND FISHERIES MEASUREMENTS (3) Introduction to field and laboratory approaches for collecting, analyzing, and communicating data regarding wildlife and fish populations and their habitats. Prerequisite: or concurrent: W F S 209, STAT 240
W F S 406 ORNITHOLOGY LABORATORY (1) Laboratory and field identification of Pennsylvania birds, avian ecology and behavior, field survey techniques. Prerequisite: or concurrent: W F S 209, W F S 300, W F S 301, W F S 310, W F S 407
W F S 407 ORNITHOLOGY (3) Introduction to the biology, ecology, adaptations, and conservation of birds. Prerequisite: BIOL 110, W F S 209
W F S 408 MAMMALOGY (3) Identification, systematics, characteristics, adaptations, ecology, behavior, natural history and conservation, and socio-economic aspects of mammals. Prerequisite: BIOL 110
W F S 409 MAMMALOGY LABORATORY (1) Laboratory and field identification of mammals, ecology and behavior of mammals, field survey techniques. Prerequisite: or concurrent: W F S 209, W F S 300, W F S 301, W F S 310, W F S 408
W F S 410 GENERAL FISHERY SCIENCE (3) Introduction to the study, management, and uses of fish populations; methods of investigation, culture, and harvest of fishes. Prerequisite: BIOL 210 or W F S 209
W F S 422 ECOLOGY OF FISHES (3) Role of fishes in aquatic communities and general ecosystems. Environmental factors influencing fish as individuals, populations, and communities. Prerequisite: BIOL 220W or W F S 209

W F S 424 AQUACULTURE (2) Scientific basis of aquaculture. Fundamental management skills for hatchery managers. Prerequisite: ONE COURSE IN BIOLOGY
W F S 430 (FOR) CONSERVATION BIOLOGY (3) The application of biological principles to issues in the conservation of biodiversity. Prerequisite: BIOL 220W or FOR 308
W F S 440 NATURAL RESOURCES PUBLIC RELATIONS (3) The course prepares students to integrate public relations concepts with principles of natural resources management at the community level. Prerequisite: SPCOM 100, seventh-semester standing, and 6 credits of W F S, FOR, or R P M
W F S 446 WILDLIFE AND FISHERIES POPULATION DYNAMICS (3) Concepts and estimation of mammalian, avian, and fish populations; processes of mortality, natality, growth, and regulation. Prerequisite: W F S 209
W F S 447W WILDLIFE MANAGEMENT (3) Management of renewable wildlife resources by applying ecological concepts, habitat evaluation, and decision-making; writing and editing reports are emphasized. Prerequisite: W F S 209 or W F S 309
W F S 450 (E R M) WETLAND CONSERVATION (3) Wetland types, classification, functions and values; hydrology, soils, and plants; introduction to wetland identification and delineation; wetland regulations. Prerequisite: E R M 300 or W F S 209
W F S 452 ICHTHYOLOGY (2) Study of the structure, taxonomy, systematics, and natural history of freshwater and marine fishes. Prerequisite: BIOL 110, BIOL 240W
W F S 453 ICHTHYOLOGY LABORATORY (2) Identification of fishes, major fish families, use of keys. Prerequisite: BIOL 110, BIOL 240W. Prerequisite or concurrent: W F S 452
W F S 463W FISHERY MANAGEMENT (3) Management of sport and commercial fisheries, including biological, political, social, and economic factors; regulations and other management techniques. Prerequisite: W F S 209, W F S 300, W F S 301, W F S 310
W F S 495 WILDLIFE/FISHERIES INTERNSHIP (1–6) Supervised field experience related to the student's major. Prerequisite: approval of proposed assignment by instructor prior to registration
W F S 496 INDEPENDENT STUDIES (1–18)
W F S 497 SPECIAL TOPICS (1–9)
W F S 499 (GI) FOREIGN STUDIES (1–12 per semester)

WOMEN'S STUDIES (WMNST)

College of the Liberal Arts

WMNST 001 (GS;GI) INTRODUCTION TO WOMEN'S STUDIES (3) Interdisciplinary consideration of the scholarly theories and research pertaining to women's experiences and women's status in contemporary American society.
WMNST 003 (GH;GI) INTRODUCTION TO WOMEN, THE HUMANITIES, AND THE ARTS (3) Interdisciplinary consideration of primary works and scholarship pertaining to women in the humanities and the arts.
WMNST 005 (GI) (S T S) INTRODUCTION TO WOMEN IN SCIENCE, TECHNOLOGY, AND ENGINEERING (3) The role of women and gender in science, technology, and engineering.
WMNST 083S (GH;GI) FIRST-YEAR SEMINAR IN WOMEN'S STUDIES (3) Critical approaches to the dimensions and directions in Women's Studies.
WMNST 101 (GH;GI) (AAA S) THE AFRICAN AMERICAN WOMAN (3) The sociological, historical and political experiences of African American women, their roles and contributions to society.
WMNST 102 (GH;GI) (AAA S) WOMEN OF COLOR: CROSS-CULTURAL PERSPECTIVE (3) Global examination of value systems of women of color; attention to minority ethnic groups in the United States and developing countries.
WMNST 103 (GI) (AAA S;SOC) RACISM AND SEXISM (3) Critical analysis of the structure of race and gender inequality in the contemporary United States.
WMNST 104 (GH;GI) (AM ST) WOMEN AND THE AMERICAN EXPERIENCE (3) Selected aspects of the role of women in United States history and culture from colonial to modern times.
WMNST 110 (GS;GI) (SOC) SOCIOLOGY OF GENDER (3) Changing sex role expectations and behavior for men and women in contemporary society.
WMNST 116 (GS) (HIST) FAMILY AND SEX ROLES IN MODERN HISTORY (3) Historical perspectives on the Western family since 1500: gender roles, marriage, sexuality, child rearing, and old age; emphasis on United States.
WMNST 117 (GH;GI) (HIST) WOMEN IN MODERN HISTORY (3) Modernization and women: changing images and roles since mid-eighteenth century in the family, workshop, politics, society. Cross-cultural comparisons.
WMNST 130 (RUS) WOMEN IN RUSSIAN LITERATURE (3) Survey of Russian women characters and writers from the Medieval Period to the present.
WMNST 136 (GI) (L I R) RACE, GENDER, AND EMPLOYMENT (3) Industrial relations and legislative and policy responses to labor force issues of racial and gender inequality.
WMNST 137 (GH) (RL ST) WOMEN AND RELIGION (3) Jewish and Christian religious views on womanhood; thought and lives of important religious women; and feminist understandings of these. Prerequisite: third-semester standing

WMNST 187 WOMEN'S STUDIES FRESHMAN SEMINAR (3) The meaning and advantages of a Liberal Arts education in context of a specific discipline. Prerequisite: first-semester standing and enrollment in the College of the Liberal Arts
WMNST 194 (GH;GI) (ENGL) WOMEN WRITERS (3) Short stories, novels, poetry, drama, and essays by British, American, and other english-speaking women writers.
WMNST 197 SPECIAL TOPICS (1–9)
WMNST 199 (GI) FOREIGN STUDIES (1–12)
WMNST 201 CAREER IMPLEMENTATION STRATEGIES FOR WOMEN (2) Determining career goals, developing strategies to achieve these goals, and developing skills to assist in the job search.
WMNST 202 (GS;GI) (AAA S) GENDER DYNAMICS IN AFRICA (3) Critical analysis of multidisciplinary research on relations between men and women in Africa and critique of Western feminist theories.
WMNST 205 (GI) (COMM) WOMEN, MINORITIES, AND THE MEDIA (3) Analysis of historical, economic, legal, political, and social implications of the relationship between women, minorities, and the mass media.
WMNST 250 (GI) (HD FS) SEXUAL IDENTITY OVER THE LIFESPAN (3) Concepts of affectional and sexual orientation over lifespan, with emphasis on lesbian and gay male personal, family, and community adaptation. Prerequisite: 3 credits in Hd FS or 3 credits in behavioral sicences
WMNST 270 (FR) RACE AND GENDER IN LITERATURE TRANSLATED FROM FRENCH (3) A critical presentation, taught in English, of changing ideas and values on race and gender in French and Francophone literatures. Prerequisite: FR 351
WMNST 294 RESEARCH PROJECT (1–12)
WMNST 296 INDEPENDENT STUDIES (1–18)
WMNST 297 SPECIAL TOPICS (1–9)
WMNST 299 (GI) FOREIGN STUDIES (1–12)
WMNST 301 INTRODUCTION TO FEMINIST THOUGHT (3) An interdisciplinary survey of historical and contemporary feminist theories in both the United States and international contexts. Prerequisite: WMNST 001 or WMNST 003
WMNST 395 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
WMNST 399 (GI) FOREIGN STUDIES (1–12)
WMNST 400 (GI) FEMINIST THEORY (3) Consideration of feminist theories of women's experience in transforming understanding, reconceptualizing old problems, raising new ones, and expanding traditional disciplines. Prerequisite: WMNST 301
WMNST 401 FEMINIST PERSPECTIVES ON RESEARCH AND TEACHING (3) Feminist approaches to methodological issues in research and teaching in the social sciences and the humanities. Prerequisite: WMNST 001 OR WMNST 003; WMNST 400W
WMNST 407 (GI) (THEA) WOMEN AND THEATRE (3) A study of theatre practice and dramatic literature as informed by issues of gender, race, and ethnic background. Prerequisite: THEA 100
WMNST 410 (AAA S) SPIRIT, SPACE, SURVIVAL: CONTEMPORARY BLACK WOMEN (3) How recent Black women have used spirit and space to survive. Prerequisite: WMNST 101
WMNST 412 (EDTHP) EDUCATION AND THE STATUS OF WOMEN (3) An examination of the relationship of education to the status of women in American society.
WMNST 415W (GI) (GEOG) GENDER AND GEOGRAPHY (3) Description and explanation of the links between gender relations and spatial structures; gender and work, social services, and neighborhood activism. Prerequisite: GEOG 020, GEOG 100, GEOG 120, WMNST 001, OR WMNST 187
WMNST 419 (HIST) THE HISTORY OF FEMINIST THOUGHT (3) A critical analysis of European and United States feminist thought from the Renaissance to the present. Prerequisite: WMNST 001, WMNST 003, WMNST 116, OR WMNST 117
WMNST 420 (GI) (CEDEV;R SOC) WOMEN IN DEVELOPING COUNTRIES (3) Analysis of women's work, experiences, and development policies and practices in Africa, Asia, and Latin America.
WMNST 421 (HIST) THE HISTORY OF EUROPEAN WOMEN (3) European women's lives from the Middle Ages to the present. Prerequisite: WMNST 001, WMNST 003, WMNST 116, or WMNST 117
WMNST 423 (GI) (ADM J) SEXUAL AND DOMESTIC VIOLENCE (3) Legal, sociological, and psychological perspectives of sexual and domestic violence. Prerequisite: ADM J 111 or WMNST 001
WMNST 424 (KINES) WOMEN AND SPORT (3) An interdisciplinary approach to contemporary issues related to women and sport from historical, physiological, psychological, and sociological perspectives. Prerequisite: PSY 002, PSY 270, PSY 471, SOC 001, or WMNST 001
WMNST 428 (GI) (PL SC) GENDER AND POLITICS (3) Gender in politics in the United States and around the world; major areas of women and politics research. Prerequisite: 6 credits in political science or women's studies
WMNST 438 (PHIL) FEMINIST PHILOSOPHY (3) Examines the central currents of feminist philosophy, selected problems and concepts regarding difference, gender and sex, identity, and political culture. Prerequisite: 9 credits of philosophy, including 6 credits of philosophy of the 200-level
WMNST 452 (BB H;NURS) WOMEN'S HEALTH ISSUES (3) Exploration of major health issues concerning women today, with an emphasis on social, cultural, and medical influences. Prerequisite: BIOL 141 or PSY 002

WMNST 453 (GI) (ADM J) WOMEN AND THE CRIMINAL JUSTICE SYSTEM (3) This course focuses on the experiences of women as offenders, victims, and professionals in the criminal justice system. Prerequisite: ADM J 111 OR WMNST 001
WMNST 455 (GI) (CAS) GENDER ROLES IN COMMUNICATION (3) Explores the literature on gender research in the discipline of human communication. Prerequisite: CAS 202
WMNST 456 (SOC) GENDER, OCCUPATIONS, AND PROFESSIONS (3) The role of gender in shaping contemporary North American patterns of employment, occupational roles, and statuses. Prerequisite: SOC 001 OR WMNST 001
WMNST 457 (HIST;S T S) THE HISTORY OF WOMEN IN SCIENCE (3) Critical analysis of the roles women, gender, and minorities have played in the natural sciences. Prerequisite: WMNST 001, WMNST 003, WMNST 005, WMNST 116, or WMNST 117
WMNST 458 (BB H) CRITICAL ISSUES IN REPRODUCTION (3) Examination and analysis of the new reproductive technologies from the standpoint of medical ethics, feminism, and sociocultural influences. Prerequisite: BIOL 141 or PSY 002
WMNST 462 (GI) (ENGL) READING BLACK, READING FEMINIST (3) Female identity and its construction in textual representations of gender, class, color, and cultural difference in English-language literatures. Prerequisite: ENGL 015 or ENGL 030
WMNST 466 (GI) (HIST) LESBIAN AND GAY HISTORY (3) Critical exploration of the history of sexuality, focusing especially on the emergence of modern lesbian and gay identities. Prerequisite: WMNST 001, WMNST 117
WMNST 471 (GI) (PSY) THE PSYCHOLOGY OF GENDER (3) Theories and research on gender differences and gender roles. Emphasis on women's and men's current positions in society. Prerequisite: PSY 002, PSY 217
WMNST 476W (ANTH) ANTHROPOLOGY OF GENDER (3) Cross-cultural construction of gender and sex roles; theories of gender construction; case studies and practical effects. Prerequisite: 3 credits in women's studies or anthropology
WMNST 490 (GI) (ENGL) WOMEN WRITERS AND THEIR WORLDS (3) American and British literature written from the perspective of women. Prerequisite: ENGL 015 OR ENGL 030
WMNST 492W CURRENT FEMINIST ISSUES (3) Critical analysis of major contemporary feminist research and writing in the arts, humanities, social and natural sciences. Prerequisite: WMNST 301, WMNST 302
WMNST 494 RESEARCH PROJECT (1–12)
WMNST 495 INTERNSHIP (1–18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor
WMNST 496 INDEPENDENT STUDIES (1–18)
WMNST 497 SPECIAL TOPICS (1–9)
WMNST 499 (GI) FOREIGN STUDIES (1–12)

WOMEN'S STUDIES (WOMST)

Capital College

WOMST 315 ISSUES IN WOMEN'S STUDIES (3) An interdisciplinary examination of historical and contemporary women's studies issues.
WOMST 325 (C HIS) WOMEN IN MODERN HISTORY (3) Status, roles, and activities of women since 1700; focus on Europe and selected non-Western areas.
WOMST 410 (GI) (PUBPL) WOMEN IN POLITICS (3) Course examines the women's movement, the participation of women in politics, selected areas of public policy, and feminist theory.
WOMST 415 FEMINIST THOUGHT (3) An examination of feminist thought in such disciplines as sociology, psychology, education, literature, philosophy, history, political science, and the sciences. Prerequisite: WMNST 001 OR WOMST 315
WOMST 430 (GI) (AMSTD) WOMEN IN AMERICAN SOCIETY (3) A historical study of women's roles and experiences in the United States. Prerequisite: 6 credits of American Studies, Sociology, or Women's Studies
WOMST 436 (GI) (CRIMJ) WOMEN IN THE CRIMINAL JUSTICE SYSTEM (3) This culturally diverse course will analyze the status of women in all aspects of the criminal justice system.
WOMST 464 (GI) (BE SC) FEMININE/MASCULINE (3) Study of sex role learning; investigating feminine/masculine labeling; implications for contemporary society. Prerequisite: general psychology or general sociology
WOMST 465 (PSYC) PSYCHOLOGY OF WOMEN (3) Explores topics pertaining to women including sex role socialization and developmental stages.
WOMST 489 (ENGL) BRITISH WOMEN WRITERS (3) A study of selected British women writers. Prerequisite: 6 credits of ENGL, ENLSH, or LIT
WOMST 491 SEMINAR IN WOMEN'S STUDIES (3) A seminar in one or more areas of women's studies. (May be repeated for credit.) Prerequisite: WOMST 315 or permission of program
WOMST 492 (AMSTD; ENGL) AMERICAN WOMEN WRITERS (3) A study of selected American women writers. Prerequisite: 6 credits of ENGL, ENLSH, or LIT
WOMST 494 RESEARCH PROJECT (1–12)
WOMST 496 INDEPENDENT STUDIES (1–18)
WOMST 497 SPECIAL TOPICS (1–9)

WOOD PRODUCTS (W P)

College of Agricultural Sciences

W P 200W (FOR) PROFESSIONAL CAREERS IN FOREST RESOURCES (3) Introduction to managing forests for products and services to meet human needs; developing career goals and an academic plan. Concurrent: W P 203

W P 203 ANATOMICAL PROPERTIES OF WOOD (1) Provide information on tree form/growth, cell wall formation/composition, structure of wood/bark cells; macroscopic/microscopic identification of hardwood/softwood cells.

W P 203L (FOR) FIELD DENDROLOGY AND ANATOMICAL PROPERTIES OF WOOD (3) Field and laboratory identification of native and introduced trees and shrubs by leaf, fruit, bud, twig, bark, and anatomical wood properties.

W P 203P (FOR) FIELD DENDROLOGY AND ANATOMICAL PROPERTIES OF WOOD Field and laboratory identification of native and introduced trees and shrubs by leaf, fruit, bud, twig, bark, and anatomical wood properties.

W P 296 INDEPENDENT STUDIES (1–18)

W P 297 SPECIAL TOPICS (1–9)

W P 337 WOOD TECHNOLOGY (2) An introduction to forest tree structure, function, and growth and the identification of important commercial hardwoods and softwoods. Prerequisite: W P 203

W P 400 PROPERTIES OF WOOD (2) Chemical Structure and Mechanical Properties of Wood Composites. Prerequisite: W P 200W

W P 411 WOOD-ENVIRONMENTAL RELATIONSHIPS (4) Material composition and structure; basic and derived physical properties; moisture movement in wood; methods and techniques of drying wood. Prerequisite: or concurrent: W P 200W, W P 203

W P 412 WOOD IN STRUCTURES (3) Behavior and design of solid, laminated, and plywood wood beams, trusses, columns, and foundations. Wood construction details. Prerequisite: W P 200W, W P 203

W P 413 THE CHEMISTRY OF WOOD (3) Chemical composition, reactions, and properties in relation to products and the uses of wood. Prerequisite: W P 200W, W P 203

W P 416 WOOD INDUSTRIES MANAGEMENT DEVELOPMENT (3) Managerial concepts and issues important to forest products organizations will help prepare students to assume management-level positions. Prerequisite: W P 200

W P 417 WOOD PRODUCTS MANUFACTURING SYSTEMS AND PROCESSES (4) Description of systems and processes used in the manufacture of wood products. Prerequisite: W P 200W, W P 203, and sixth-semester standing

W P 418 CHEMICAL PROCESSING OF WOOD (4) Principles and practices of basic operations in converting wood and wood waste into useful chemicals and modified cellulose products. Prerequisite: W P 200W, W P 203

W P 423 DETERIORATION AND PROTECTION OF WOOD PRODUCTS (2) Timber and wood deterioration from fungi, insects, fire; treatment of wood products for protection. Prerequisite: W P 203

W P 435 WOOD PRODUCTS PRODUCTION AND SALES MANAGEMENT (3) Wood products production management with emphasis on investment decision- making, personal selling, and sales management. Prerequisite: W P 200W

W P 437W WOOD INDUSTRIES MARKETING MANAGEMENT (4) Examination of major international wood products market segments in terms of products, distribution, industry structure, and strategic management issues. Prerequisite: W P 200W, W P 203

W P 438 BUSINESS CONCEPTS FOR WOOD MANUFACTURING (4) The course will cover manufacturing strategies and related financial measures in a wood production environment. Prerequisite: W P 200W

W P 460 WOOD PRODUCTS INDUSTRIAL ENVIRONMENTAL CONTROL (3) Wood products industrial environmental control technologies and strategies for pollution abatement. Prerequisite: fifth-semester standing.

W P 490 WOOD PRODUCTS COLLOQUIUM (1) Presentations and discussions of solutions to problems within the forest products industry. Prerequisite: seventh-semester standing

W P 495 WOOD PRODUCTS INTERNSHIP (1–6) Supervised field experience related to the student's major. Prerequisite: approval of proposed assignment by instructor prior to registration.

W P 496 INDEPENDENT STUDIES (1–18)

W P 497 SPECIAL TOPICS (1–9)

W P 499 (GI) FOREIGN STUDIES (1–12 per semester)

WORKFORCE EDUCATION AND DEVELOPMENT (WF ED)

College of Education

WF ED001 EDUCATION FOR WORK: TRENDS AND ISSUES (3) Overview of the history and philosophies of education for employment, current issues, and school to work transition system.

WF ED 100 ORIENTATION TO TEACHING VOCATIONAL INDUSTRIAL EDUCATION/HEALTH OCCUPATIONS EDU CATION SUBJECTS (2) Basic elements of preparing to teach vocational trade and industrial/health occupations education subjects in the schools of Pennsylvania.

WF ED 101 EARLY FIELD EXPERIENCE IN TEACHING VOCATIONAL INDUSTRIAL EDUCATION/HEALTH OCCUPATIONS EDUCATION SUBJECTS (1) Discussion and observation of in-

school practices to aid the student in making vocational industrial education/health occupations education career decisions.

WF ED 105 INTEGRATED CURRICULUM IMPLEMENTATION (3) Occupational analysis for instructional planning; emphasis on instructional methods to deliver a competency based program in an integrated learning environment. Prerequisite: EDPSY 014

WF ED 106 PROGRAM AND FACILITIES MANAGEMENT (3) Organization and management of learning laboratory to facilitate the delivery of a competency based program in a safe environment.

WF ED 197, 198; 297, 298; 397, 398; 497. 498 SPECIAL TOPICS (1–9)

WF ED 207W ASSESSMENT TECHNIQUES (3) Assessment, recording, and reporting of learning in an integrated competency based vocational education system. Prerequisite: WF ED 105

WF ED 270 INTRODUCTION TO INDUSTRIAL TRAINING (3) Overview of training profession. Introduction to economic and psychological foundations. Examination of relationship of industrial training to education.

WF ED 296, 496 INDEPENDENT STUDIES (1–18)

WF ED 323 VOCATIONAL STUDENT ORGANIZATIONS (3) Methods in originating, managing, and advising vocational student organizations.

WF ED 395A TRADE AND INDUSTRIAL OCCUPATIONAL EXPERIENCE (1–8 per semester, maximum of24) Individual work experience in manufacturing environment or skilled craft area to develop professional competence in specific occupation. Prerequisite: completion of an occupational learning period in the field of certification or field of specialization

WF ED 395B OCCUPATIONAL HOME ECONOMICS WORK EXPERIENCE (1–8 per semester, maximum of24) Individual work experience in service occupations such as food service, textile production, or child care. Prerequisite: completion of a two-year formal learning period in the field of specialization

WF ED 395C HEALTH OCCUPATIONS WORK EXPERIENCE (1–8 per semester, maximum of24) Individual work experience in an allied or professional healthcare setting. Prerequisite: completion of a two-year formal learning period in the field of specialization

WF ED 395D OCCUPATIONAL WORK EXPERIENCE (1–8 per semester, maximum of24) Individual work experience in the manufacturing, health, service, or financial arena.

WF ED 402 SUPERVISION OF VOCATIONAL EDUCATION (3) For administrators, supervisors, and teachers responsible for improvement of instruction through supervision or for students preparing for supervisory work.

WF ED 413 VOCATIONAL EDUCATION FOR SPECIAL-NEEDS LEARNERS (3) Introduction to program modifications, supplementary services, and resources required for special-needs learners in vocational and practical arts education programs.

WF ED 422 INTEGRATING COMMUNICATION SKILLS INTO THE VOCATIONAL CLASSROOM (3) Students completing this course will demonstrate their ability to integrate oral, written, visual communication skills into their occupational classroom.

WF ED 441 CONCEPTUAL AND LEGAL BASES FOR COOPERATIVE VOCATIONAL EDUCATION (2) History, conceptual and legal bases for a cooperative vocational education program. Prerequisite: WF ED 445

WF ED 442 OPERATING COOPERATIVE VOCATIONAL EDUCATION PROGRAMS (2) Student and training station selection, training plan and related subject development, records and reporting systems, school-industry coordination. Prerequisite: WF ED 441

WF ED 445 VOCATIONAL GUIDANCE (3) Problems and possibilities of vocational guidance; the field of guidance and guidance literature; methods of field work; school guidance techniques. Prerequisite: WF ED 105; fourth-semester standing

WF ED 450 CULTURAL DIVERSITY IN THE WORKPLACE (3) Provides opportunities for students to explore different cultures and mores that are changing the dynamics of the workplace.

WF ED 471 TRAINING IN INDUSTRY AND BUSINESS (3) Appraisal of training functions and development of competencies in work analysis, design, development, delivery, and evaluation of training. Prerequisite: seventh-semester standing or higher

WF ED 495 INTERNSHIP (1–6) Supervised off-campus, nongroup instruction including field experiences, practicums, or internships. Written and oral critique of activity required. Prerequisite: prior approval of proposed assignment by instructor

WF ED 495A COOPERATIVE EDUCATION PRACTICUM (2) Validation of competencies learned in prerequisite courses during interaction with professional staff while functioning under the supervision of a certified cooperative coordinator. Prerequisite: WF ED 445

WF ED 495C STUDENT TEACHING (10) Supervised observation and practice teaching in approved vocational industrial schools/health occupations education settings. Prerequisite: successfull completion of occupational competency evaluation. PA Act 34 clearance required. In addition, non-Pennsylvania residents must provide evidence of an FBI background information check. (Forms: 228 Chambers)

WF ED 495D INSTRUCTIONAL INTERNSHIP IN INDUSTRIAL TRAINING (5) Supervised internship in industrial training. Interns will be expected to perform instructional duties in industrial environments. Prerequisite: WF ED 105, WF ED 106, WF ED 207W, WF ED 270, WF ED 471; successful completion of occupational competency examination

YOUTH AND FAMILY EDUCATION (YFE)

College of Agricultural Sciences

YFE 295 INTERNSHIP (1–18)

YFE 295A OBSERVATION OF COOPERATIVE EXTENSION SERVICE PROGRAMS (1–2) Supervised observation of extension education in agriculture, community resource development; family living, 4-H programs; appraisal of responsibilities of extension professionals.

YFE 297, 298; 397. 398; 497. 498 SPECIAL TOPICS (1–9)

YFE 438 TEACHING IN AN INCREASINGLY DIVERSE SOCIETY (1–3) Students in this course will explore selected dimensions of diversity through lecture, discussion, speakers, active participation, and experiential learning.

YFE 439 CONTEMPORARY YOUTH ISSUES (3) This course focuses on empirically-supported interventions that promote resiliency and reduce risk for problem behaviors among youth in community settings. Prerequisite: a minimum of six credits in courses that focus on youth and/or families

YFE 455 EXTENSION YOUTH DEVELOPMENT PROGRAMS AND VOLUNTEER MANAGEMENT (3) A study of 4-H/Extension youth programs and the variety of roles played by volunteer leaders. Prerequisite: 6 credits of social or behavioral sciences

YFE 495 INTERNSHIP IN YOUTH AND FAMILY EDUCATION PROGRAMS (1–18) Supervised off-campus, nongroup instruction including field experiences, practicums, or internships. Prerequisite: prior approval of proposed assignment by instructor

YFE 496 INDEPENDENT STUDIES (1–18)

YFE 499 (GI) FOREIGN STUDIES (1–12)

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